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Corporate Social Responsibility, Efficiency, and Risk in US Banking

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Abstract: Banks have faced increasing attention regarding their ability to balance Corporate Social Responsibility (CSR) initiatives, operational efficiency, and credit risk management, particularly in the wake of global financial challenges. This study examines the interplay between CSR, efficiency, and credit risk in 131 US banks from 2010 to 2018. Using the Choquet integral, two-step Data Envelopment Analysis, and a dynamic panel with the Generalized Method of Moments, the findings reveal a virtuous circle between CSR and credit risk, where CSR enhances credit risk profiles. Similarly, efficiency and risk exhibit mutual reinforcement. However, a vicious circle is identified between CSR and efficiency, indicating trade-offs between CSR objectives and operational efficiency. These insights guide policymakers and bank managers in optimizing this balance.

Keywords: CSR; efficiency; integral of Choquet; DEA two stages; banking risk; corporate sustainability

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1. Introduction

In recent years, corporate social responsibility (CSR) has acquired increasing attention from businesses, the financial sector, regulators and policy makers. This heightened focus on responsible practices has also driven an increase in academic studies exploring the financial impacts of CSR. International bodies have focused more on sustainability, which is represented by the incorporation of three key spheres: environmental, social, and economic. Sustainability combines the goals of economic efficiency, social equity, and environmental sustainability, all within a framework of good governance.

Despite the broad macroeconomic scope of sustainable development and the involvement of all socioeconomic actors, it remains heavily dependent on the actions of businesses, the primary economic drivers. Sustainability trends have significantly altered the way businesses operate. International organizations such as the United Nations (UN), the Sustainability Accounting Standards Board (SASB), the World Business Council for Sustainable Development (WBCSD), the Principles for Responsible Investment (PRI), and the Global Reporting Initiative (GRI) have supported this shift by establishing best practices, guiding principles, and standards for businesses to manage their operations and assets more sustainably. The implementation of the principles of sustainable development at the company level has resulted in the concept of Corporate Social Responsibility.

Although CSR has received a lot of public attention, there is still substantial disagreement over how it should be defined and how its underlying principles should be developed.

Some have referred to it as "greenwashing or whitewashing", a trend that businesses use as a simple marketing strategy to cover corporate communication with a social complexion (Wolak-Tuzimek and Duda 2015). Others disagree, referring to CSR as a groundswell and an essential strategy for adjusting to the modern economy's new needs and for remaining competitive. CSR is a multifaceted idea that has grown over time to include ever more new characteristics.

Companies in general, the banking industry in particular, play a significant role in sustainable growth. Banks encourage borrowers to follow CSR practices and penalize those who do not. Carnevale and Drago (2024) conducted a comprehensive literature review of 41 papers to analyze the impact of borrowers' ESG performance on bank loan terms. Their findings suggest that lenders often impose higher interest rates on borrowers with poor ESG practices. According to Sustainalytics Thematic Research (2014), banks are the leading and preeminent players in all contemporary marketplaces for a variety of reasons. First, banks are essential economic components. They foster innovation, economic growth, and prosperity by injecting financial resources as the system's lifeblood. According to Fengju and Wubishet (2024), banks play a crucial role in economic expansion and can create a variety of external advantages for society. They contribute to sustainable prosperity by easing the transfer of funds between lenders and borrowers (Shen and Zheng 2024; King and Levine 1993). Second, in comparison to other industries, banks are held to a higher standard of input to interested parties such as governments, the media, and communities (Challoumis and Eriotis 2024; Wu and Shen 2013). Because banks benefit from society's support, such as government guarantees or even bailouts (Berger et al. 2024; Iannotta et al. 2013), public opinion often demands that they engage in CSR (Skana and Gjerazi 2024; Shen et al. 2016). As a result, the role of financial institutions often extends beyond their traditional function as intermediaries. While the primary role of banks as catalysts for economic growth and prosperity remains uncontested, civil society, especially in developed countries, is increasingly concerned about how they may be exceeding this role. Many have emphasized the need for a socially and environmentally conscious form of moral capitalism. Although banks do not directly impact society and the environment, their influence on the enterprises they finance allows them to have an indirect effect.

Following the 2008–2009 financial crisis, which raised concerns about the behavior of financial institutions, researchers have increasingly focused on the role of CSR in the banking sector and its impact on bank performance and risk. This is particularly interesting, considering that banks are often excluded from empirical studies due to their distinctive characteristics. As a result, most research works that link CSR and finance do not evaluate the banking sector.

According to Firmansyah and Kartiko (2024), several studies are interested in examining the relationship between CSR and financial performance via the consideration of performance ratios (ROA, ROE, etc.). Nevertheless, not too many studies are interested in analyzing the association between CSR and bank efficiency (a measure of financial performance).

Banks produce numerous outputs utilizing several inputs, which explains the analysis of complex multidimensional organizations that they institute. Due to their univariate nature, the use of ratios to evaluate banking performance has certain limitations and is problematic. Most studies of bank performance employ efficiency frontier techniques to address the limitations of ratio analysis (Istaiteyeh et al. 2024; Luo et al. 2016; Berger and Humphrey 1997).

In addition to its link with company performance, CSR also influences risk behavior (Hojer and Mataigne 2024). Several researchers are interested in examining the CSR–Risk relationship, but the majority of empirical evidence examining this relationship focuses on

the non-financial sector and has produced inconsistent findings (Caterina and Thornton 2020). Consequently, studies exploring the CSR–risk nexus in the banking sector are extremely limited and inconclusive due to the omission of banks from empirical study samples due to their unique characteristics.

To our knowledge, we notice that there is no academic research studied the interrelation between CSR, efficiency, and risk in the banking sector. This study aims to examine the interrelation between CSR, efficiency, and credit risk in the American banking sector. Using a dynamic panel approach with a bank's financial data, this research provides evidence on how CSR impacts bank efficiency and credit risk while exploring whether these relationships form a virtuous cycle. Our findings demonstrate a positive correlation between Corporate Social Responsibility (CSR) activities and bank efficiency while simultaneously reducing credit risk. This suggests that responsible business practices contribute to both improved financial performance and positive societal outcomes. Notably, achieving lower risk levels appears to be linked to higher levels of bank efficiency, suggesting a virtuous cycle between these two factors. Furthermore, our results indicate a virtuous cycle between CSR and risk, as well as between efficiency and risk. However, we also observed a "vicious circle" relationship between CSR and efficiency.

This study contributes to the literature in several ways. First, it bridges the gap in CSR research by focusing on the banking sector, which is often excluded from empirical studies due to its unique characteristics. Building upon previous research that primarily linked CSR to profitability through univariate measures like ROA and ROE (Wu et al. 2017; Taskın 2015; Wu and Shen 2013; Soana 2011), this study employs efficiency frontier techniques, addressing the limitations of ratio-based performance evaluation and providing a more nuanced understanding of the relationship between CSR and bank performance. Furthermore, this study extends the nascent but growing body of research on the CSR–risk nexus by focusing on credit risk, an area with limited and inconclusive findings in the banking context. Unlike previous studies (Belasri 2020; Caterina and Thornton 2020; Neitzert and Petras 2022; Bouslah et al. 2018) that have primarily focused on the impact of CSR on individual metrics (e.g., efficiency or risk), this study investigates the dynamic interrelationships between CSR, efficiency, and risk in the banking sector, providing a more holistic perspective. To the best of our knowledge, this is the first study to explore these complex interconnections, offering valuable insights for policymakers, regulators, and bank managers.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes the methodology, including the data and econometric approach. Section 4 presents and discusses empirical results. Section 5 concludes the study with implications and directions for future research.

2. Literature Review and Development of Hypothesis

This section provides a comprehensive literature review on the relationship between Corporate Social Responsibility (CSR) and firm performance, specifically focusing on the CSR–efficiency relationship and CSR–risk nexus. Building on the existing literature, we develop specific hypotheses to guide our empirical investigation.

2.1. The CSR–Efficiency Relationship

In recent years, corporate social responsibility (CSR) has become a topic of great interest and discussion among businesses and academics. Managers often consider financial performance when deciding whether to adopt social responsibilities (Hassan et al. 2024; Zhu et al. 2016).

The neoclassical theory (Friedman 1962, 1970) and stakeholder theory are the main theories that have already shaped and established the basis for understanding the association between CSR and financial performance. These two theories represent two opposing viewpoints. Firstly, The shareholder perspective derives from neoclassical economic theory, which holds that the sole role of company managers is to maximize profit (Friedman 1970). From this perspective, investing in CSR strategies is a waste of funds that should be reinvested in activities that increase the company's value. Alternatively, the stakeholder perspective (Porter and Kramer 2006) suggests that prioritizing the interests of all stakeholders can improve financial performance. This perspective suggests that profit and ethical behavior are not mutually exclusive but can coexist and even reinforce each other.

In front of this theoretical dispute, various researchers have attempted to examine the relationship between CSR and financial performance empirically. Despite the fact that the majority of studies indicate a beneficial association between CSR and financial performance, the findings are also still inconclusive. This confusion may arise from the possibility that CSR has a sector-specific effect on financial performance (Haavisto 2024; Esteban-Sanchez et al. 2017). Recently, a number of academics have begun to examine CSR's effects on the banking industry. Simpson and Kohers (2002) evaluated this relationship by using a sample of 385 American national banks and found that social and financial performance are positively related. Along the same lines, Wu and Shen (2013), Shen et al. (2016), Wu et al. (2017), and Nizam et al. (2019) confirmed this tendency as they found a positive relationship among CSR and FP basing their studies on international samples and adopting conventional indicators to approximate financial performance, such as ROA and ROE.

Assessing the performance of banks using univariate measures has certain limitations, particularly when evaluating complex, multidimensional organizations that generate multiple outputs from various inputs. As a result, most studies on bank performance focus on the concept of efficiency, which reflects how effectively inputs are utilized to achieve desired outputs (Belasri et al. 2020).

Several factors indicate that CSR activities may influence a bank's inputs and outputs, ultimately affecting its efficiency. Strong CSR practices can improve a company's reputation (Branco and Rodrigues 2006; Hillman and Keim 2001), which can lead to benefits such as attracting and retaining top talent (Branco and Rodrigues 2006; Fombrun et al. 2000).

Employee productivity and loyalty are linked to more effective management of human capital resources or, from an efficiency standpoint, a more efficient use of inputs. Additionally, customers may be inclined to accept lower interest rates on their deposits if the bank demonstrates strong CSR practices (Wu and Shen 2013). From the bank's perspective, the reduced cost of deposits is comparable to a decrease in input costs.

Furthermore, the enhanced reputation gained from CSR activities can allow firms to be less aggressive in pricing their products (Fombrun et al. 2000). For banks, a solid reputation can boost profits by attracting new customers and enabling them to charge higher interest rates on loans. Kim et al. (2005) suggest that companies prefer to borrow from reputable banks, even at higher loan rates. Moreover, a strong reputation built through CSR can enable banks to charge higher fees and commissions (Wu and Shen 2013). This positive impact on both interest and non-interest income indicates that CSR can boost a bank's overall revenue.

A positive relationship between CSR and bank efficiency has been indicated by Belasri et al. (2020) based on an international sample of 184 banks during the period from 2009–2015, and a DEA dynamic network model is used to assess bank efficiency.

Based on all these points, we propose the first hypothesis:

H_1. *CSR has a positive impact on banking efficiency.*

Generally, while the majority of research indicates a positive association between CSR and financial performance, some studies have shown a negative relationship (López et al. 2007; Nollet et al. 2016; Esteban-Sanchez et al. 2017). Neoclassical economists explain the negative relationship by suggesting that engaging in social and environmental activities diverts company resources away from profit generation, thus hindering value creation for shareholders (Friedman 1970; Waddock and Graves 1997; Preston and O'bannon 1997). There are also other studies that have rejected the existence of a relationship (Taskın 2015; Justyna Fijałkowska et al. 2018).

Empirical research has identified other types of correlations. Some studies suggest that the relationship between CSR and financial performance is not linear (Hojer and Mataigne 2024). For instance, certain researchers propose a U-shaped relationship between CSR and financial performance (Hojer and Mataigne 2024; Barnett and Salomon 2012; Brammer and Millington 2008), while others point to a "virtuous circle", where CSR and financial performance reinforce each other (Waddock and Graves 1997; Nelling and Webb 2009).

This empirical evidence leads to our second hypothesis:

H_2. *There is a virtuous circle between CSR and bank efficiency.*

2.2. The CSR—Risk Relationship

In addition to its link with financial performance, CSR also influences risk behavior. The literature on the relationship between CSR and risk is mixed. Several theories give explanations of this relationship, such as Risk Management Theory, Slack Resource Theory and reputation theory.

The Risk Management Theory underscores the link between CSR and corporate risk. It emphasizes the importance of identifying, controlling, measuring, and mitigating risks inherent in business operations. According to (Bouslah et al. 2013; Vishwanathan et al. 2020), the management of the social, environmental, and ethical dimensions represent the different components of the commitment to CSR practices, and this latter has an impact both direct and indirectly on the idiosyncratic risk.

The Slack Resource Theory suggests that companies with surplus resources, often stemming from past financial success, are more likely to invest in CSR initiatives, thus improving their social and environmental performance (McGuire et al. 1988; Waddock and Graves 1997), thus also reducing the company's expected risk.

Finally, according to Lins et al. (2017), to clearly clarify the impact of CSR on the risk of the company, the theory of reputation is based on public opinion about the company. It is crucial to recognize that reputation is a delicate construct rooted in values, standards, and trust. Violating these principles can irreparably damage a company's reputation. As Delgado-Garcia et al. (2013) argue, a strong reputation encourages compliance with standards and reduces risk-taking behavior.

In light of this theoretical discussion, numerous empirical examinations of the link between CSR and company risk have been conducted. Most research, according to Gramlich and Finster (2013), finds a negative correlation between CSR and company risk.

Several studies have shown that CSR engagement can positively impact various aspects of risk in the banking sector, including systematic, total, and idiosyncratic risks (Neitzert and Petras 2022; Caterina and Thornton 2020; Bouslah et al. 2018; Bolton 2013; Boutin-Dufresne and Savaria 2004). These studies have shown the existence of a negative relationship based on the commitment to CSR practices (aggregated CSR) and banking risk.

This empirical evidence led to our third hypothesis:

H_3. *The aggregate CSR of banks is negatively linked to banking risk-taking.*

According to empirical studies, it is difficult to demonstrate a relationship between social performance and risk if just only aggregate CSR is considered. Scholtens (2008) suggests examining the various components of CSR (environment, social, and governance) and determining why they interact differently with risk, in addition to employing panel analysis. Beyond these guidelines, the CSR literature includes arguments demonstrating that different CSR dimensions interact differently with risk. For a sample of American enterprises, Bouslah et al. (2013) demonstrate that the direction of causality among business risk and social performance depends on the dimension analyzed. Therefore, a more detailed analysis is needed.

A recent study that examines the impact of the different dimensions of CSR and its sub-components on banking risk was established by Neitzert and Petras (2022) The results indicate that the environmental pillar has a considerable risk-reducing effect, whereas the social and governance pillars do not have comparably significant effects. Therefore, they argue that the three elements of CSR and environmental commitment, in particular, impact the idiosyncratic risk of banks.

According to Shane and Spicer (1983) and Spicer (1978), previous research demonstrates that companies with superior environmental performance are the least risky. For instance, Bank lending activities can be tied to environmental norms. Furthermore, Banks can foresee future adjustment requirements and the related costs by modifying their portfolio early to future environmental and social expectations; thus, environmental changes can be predicted by eco-responsible behavior (King 1995).

The social side is also very crucial, particularly for enhancing the bank's image and reputation. Multiple empirical studies have demonstrated that businesses with strong social responsibility have a lower risk profile. In this regard, a study conducted by Verwijmeren and Derwall (2010) reveals that a strong commitment to human resource procedures significantly reduces the probability of risk of bankruptcy. In addition, a negative relationship linking systematic risk with corporate social performance was found by Oikonomou et al. (2012)

Bauer et al. (2009) investigated the impact of the social dimension on idiosyncratic risk and showed that organizations with greater employee relationships have a cheaper cost of debt and a decreased level of idiosyncratic risk.

Moreover, governance policies are deemed particularly critical in the context of banking risk (John et al. 2008). The governance pillar is characterized by shareholder engagement, efficient and transparent decision-making processes, and effective management. John et al. (2008) observed that there are both positive and negative correlations between corporate governance scores and financial risks. Bouslah et al. (2013) identify a correlation between corporate governance strength and corporate risk.

Hence, this leads to the following hypothesis:

H_4. *Each element of CSR (environmental, social, and governance) reduces banking risk.*

Other forms of correlations have been identified in empirical research. It has been discovered that the relationship is not linear. According to a number of studies, there exists a "virtuous cycle" between CSR and banking risk. The virtuous circle hypothesis suggests that a bank's engagement in Corporate Social Responsibility (CSR) may reduce its risk (through better stakeholder management and enhanced reputation) and thereby increase its resources (providing it with slack financial resources). Banks with lower credit risk experience reduced financial uncertainty, enabling their managers to exercise greater discretion in advancing CSR initiatives. Furthermore, financially stable banks are less concerned about short-term survival and can focus on long-term investments, including

CSR-related activities, which in turn reinforce their stability and societal trust (Chollet and Sandwidi 2018).

Strong CSR engagement leads to enhanced reputation, reduced risk, and improved financial performance. By prioritizing ethical lending, financial inclusion, environmental sustainability, and community development, banks can attract socially responsible investors, foster customer loyalty, and mitigate regulatory scrutiny. This, in turn, strengthens their financial position, enabling further investment in CSR initiatives and driving long-term sustainable growth.

To strengthen the theoretical link between CSR and risk reduction in the banking sector, it is important to recognize how each dimension of CSR—environmental, social, and governance—contributes to risk mitigation. Environmental CSR reduces risks by promoting sustainability and avoiding environmental liabilities. Banks that adopt green practices, such as funding renewable energy projects, are less likely to face regulatory penalties and operational disruptions linked to environmental issues. Social CSR, including initiatives like financial inclusion and community development, lowers credit and operational risks. By addressing social challenges, such as poverty or inequality, banks can increase customer loyalty and reduce default rates while also enhancing their reputation in the eyes of investors and clients.

Governance CSR directly influences risk reduction by ensuring strong compliance, transparency, and internal controls. Banks with robust governance structures are better positioned to avoid legal and regulatory penalties while also mitigating strategic risks, such as poor financial decision-making. Effective governance fosters investor confidence, reducing market risks. The integration of strong governance practices also strengthens social and environmental efforts, creating a well-rounded approach to risk reduction. While each CSR dimension individually impacts risk, their effects often overlap and compound, amplifying their overall benefit to a bank's stability and reputation.

The impacts of these CSR dimensions may differ systematically depending on the bank's context and stakeholders. In regions where environmental issues are more pressing, environmental CSR may play a more prominent role in risk reduction. Similarly, investors may prioritize governance practices, while customers might care more about social and environmental concerns. The combination of these dimensions can create a virtuous circle, where improvements in one area drive positive outcomes in others, resulting in enhanced risk management and long-term stability for the bank.

Several studies support the idea of a reciprocal relationship between corporate social responsibility (CSR) and risk. According to Scholtens (2008), the commitment to socially responsible acts results in a bidirectional causality between certain CSR pillars and financial risk. Bouslah et al. (2013) produced a study that demonstrates a bidirectional causal relationship between the different dimensions of CSR and a company's risk.

The above arguments lead to our fifth hypothesis:

H_5. *There is a virtuous circle between CSR and banking risk.*

3. Data and Methodology

3.1. Sample Selection

The primary focus of this study is on the relationship between CSR and efficiency and risk from 2010 to 2018. The CSR data are sourced from the KLD Research & Analytics, Inc., Boston, MA, USA, which provide comprehensive data annually starting in 1991. The database initially covered approximately 650 companies, including those in the Domini 400 Social SM Index and the S&P 500. Beginning in 2001, KLD expanded its coverage to the largest 1000 US companies by market capitalization, and in 2003, this was further extended to include the largest 3100 US companies.

KLD evaluates firms using more than 80 qualitative indicators grouped into seven major categories: community, governance, diversity, employee relations, environment, human rights, and product issues. Each category includes indicators reflecting perceived strengths and concerns. The full database typically includes a varying number of banks each year, reaching approximately 200 banks annually between 2010 and 2018. We excluded banks that were not consistently available throughout the entire period and those with significant missing data for other variables used in the analysis. Ultimately, we utilized a sample comprising 131 US banks, representing a total of 1179 bank years.

3.2. Presentation of the Variables

3.2.1. Banking Efficiency

To determine this variable, we used efficiency scores that were calculated through inputs and outputs according to the Data Envelopment analysis method or DEA method.

The value of efficiency ranges from 0 to 1. A score of 1 indicates that the bank is efficient and placed on the frontier of efficiency (Belasri 2020). Whereas, a score below 1 implies inefficiency, which requires the bank to cut its inputs (costs) and/or boost its outputs (production).

According to the concept of Pareto–Koopmans efficiency, production is completely efficient only when it is unable to increase inputs and outputs without decreasing other inputs or outputs (Belasri 2020; Cooper et al. 2006). When a corporation reaches the efficiency frontier, where it cannot grow production for a specified level of inputs or lower the amount of resources required to create a given quantity of output, it is called efficient.

There are both parametric and nonparametric approaches for estimating the frontier's efficiency (Belasri 2020). It is believed that the nonparametric method is a superior and more robust tool for analyzing efficiency because it utilizes actual data from unit evaluations to create the efficiency frontier without designating a specific functional shape. The principal feature of this technique is that it permits the counting of multiple entries and exits. Data Envelopment Analysis (DEA) is among the most often employed nonparametric techniques.

According to Charnes et al. (1995), the DEA method is extremely successful for a variety of causes. First, it focuses on each individual observation as opposed to the overall population. Next, this method identifies a measurement for each DMU based on input components to produce the required output, despite the fact that the inputs and outputs are of various types and do not use the same units of measure. Then, it can adjust dummy variables, and it imposes no restrictions on the production function's structure (Weill 2004).

- Inputs and Outputs

The literature offers contrasting views on the role of deposits in bank efficiency (Belasri et al. 2020). Some studies consider deposits as outputs in a production-based approach, while others view them as inputs in an intermediary-based approach (Paradi and Zhu 2013). However, neither approach fully captures the complexity of banking operations (Berger and Humphrey 1997).

To address this, we adopt a two-stage DEA model. This model treats deposits as intermediate products, generated in the first stage and used as inputs in the second. Following Fukuyama and Weber (2010), the first stage utilizes Staff Expenses, Property, Plant and Equipment (Net), and Stockholders' Equity to produce deposits. These deposits, in turn, serve as inputs in the second stage to generate loans and securities.

3.2.2. Banking Risk Measures

In order to measure bank risk, we focus on risk measures based on annual accounting data and determined for each bank over the period. In particular, we consider two measures of risk that they are the non-performing loan (NPL) ratio and the loan loss reserve ratio.

The non-performing loans (NPLs) ratio is calculated by the ratio of non-performing loans to loans, while the loan loss reserve ratio is the ratio of the reserve for credit losses (assets) to loans.

3.2.3. A CSR Measure

Employing data from MSCI ESG (KLD) stats, we have built a valid measure of corporate social responsibility performance. The MSCI ESG (KLD) stats are presented as a database considered commonly used in CSR studies (for example, Kim et al. 2012; El Ghoul et al. 2011; Goss and Roberts 2011; Baron et al. 2011; Harjoto et al. 2015).

Even though some basic elements of the KLD database have already been criticized by certain research (e.g., Chatterji et al. 2009), this database is among the most perfect and widely used data sources in specialized studies on CSR (Mattingly and Berman 2006; Harjoto and Jo 2011), giving it a high level of dependability and accuracy. According to Waddock (2003, p. 371), "KLD's database has proven to be factual, dependable, comprehensive, and maintained with consistency and openness over the previous decade".

- Construction of a CSR measure: multi-criteria aggregation

CSR measurement is characterized by multiple components, or called criteria, that could interfere with each other, which explains the existence of a problem that has various attributes when measuring CSR (Munda 2005).

A method widely used to deal with criteria interaction phenomena in the context of multi-criteria is the decision framework based on the Choquet integral. As a non-additive integral, it is often applied as an aggregation operator to obtain the global satisfaction of each alternative (Choquet 1953).

We propose to use an approach with an optimization model to objectively determine the interaction coefficients and the weights of the criteria at several levels. The approach is developed on the basis of various theories, which are Shapley's theory of value, fuzzy measures and Marichal's entropy with the exploitation of objective data. According to (Deng et al. 2000), in order to ensure that the result of the evaluation is not impacted by the uncertainty or even the inconsistency of subjective judgments, it is necessary to use data of weights considered objective. Therefore, this approach represents a solution to the problems concerning the multi-criteria decision for which the interferences and the scores or weights of interdependent criteria cannot be acquired in a subjective and reliable way (Chouchene et al. 2024).

The Choquet integral is a powerful tool used in decision-making and evaluation contexts, particularly when criteria are interdependent and influence each other. Unlike traditional methods that treat each criterion as independent, the Choquet integral allows us to model interactions between criteria, such as complementarity or redundancy. In this study, we use the Choquet integral to aggregate various Corporate Social Responsibility (CSR) items into three components (environment, social, and governance) and combine them into a single comprehensive score.

To apply the Choquet integral, the first step is to define the problem and identify the relevant criteria. Next, assign a weight or importance to each criterion and their combinations using a fuzzy measure. This step captures the individual importance of each criterion and how groups of criteria work together (Chouchene et al. 2024; Tajani et al. 2022; Kojadinovic 2008).

Once the weights are set, the next step is to score each criterion for the options under consideration. The scores and weights are then combined using the Choquet integral formula. This process adjusts the overall score to reflect not just the individual performance on each criterion but also the interactions between them.

The Choquet integral is a sophisticated aggregation method designed to account for interactions among multiple criteria, making it particularly effective for evaluating complex phenomena where attributes are interdependent. This method relies on a fuzzy measure, also known as capacity, which assigns weights to subsets of criteria based on their importance and interaction. The capacity adheres to specific conditions, including boundary constraints, where the measure is zero for an empty set and one for the full set, and monotonicity ensures that larger subsets are assigned greater or equal importance than smaller ones (Marichal and Roubens 2000).

This approach considers various types of interactions among attributes. Additive measures treat subsets as independent, with their combined importance equaling the sum of their individual measures. Sub-additive measures model situations where combined subsets are less important than the sum of their separate weights, reflecting diminishing returns. Sub-modular measures, on the other hand, capture redundancies or complementarity, indicating whether attributes reinforce or reduce each other's impact when combined (Chouchene et al. 2024; Tajani et al. 2022).

The methodology leverages concepts such as the Shapley value and interaction index to understand and quantify the contributions of individual attributes and their pairwise interactions (Shapley 1953; Grabisch 1997). The Shapley value provides a comprehensive measure of each criterion's overall importance by averaging its marginal contributions across all possible subsets. Similarly, the interaction index quantifies the extent and nature of relationships between pairs of attributes, helping to reveal whether their combined effect is complementary or redundant (Kojadinovic 2008; Grabisch 1997).

To establish the fuzzy measure objectively, data-driven approaches based on information theory are employed. These methods use entropy, a concept that quantifies uncertainty or information content, to determine the weights of subsets. This eliminates the need for subjective judgments and ensures that the aggregation process is grounded in the available data. The entropy-based model considers probabilistic measures to estimate the importance and interaction of criteria, providing a systematic and unbiased capacity determination (Tajani et al. 2022; Kojadinovic 2008; Cover and Thomas 1991).

The Choquet integral is further refined using optimization models that maximize the effectiveness of the aggregation. These models allocate weights to each criterion while ensuring consistency with the Shapley value, adherence to normalization constraints, and respect for the monotonicity condition. This approach guarantees that the resulting weights reflect the real-world relationships among attributes, offering a reliable framework for decision-making and evaluation in scenarios with complex interdependencies.

3.3. Methodology

To examine the relationship between CSR, efficiency, and risk, we will apply the Generalized Moment System (Sys-GMM) estimation method.

We will present what follows the model and the techniques necessary for the estimation. Indeed, the endogenous relationship of CSR, efficiency, and risk of banks leads us to prefer Sys-GMM as an estimation method. In addition, Roodman (2009) showed that this estimation technique is robust when the number of banks (N = 131) is greater than the number of years (T = 9) to control the bias of the dynamic panel. Thus, Blundell and Bond (1998) concluded that the Sys-GMM estimator appears to be more efficient than the difference-GMM (Diff-GMM) estimator suggested by Arellano and Bond (1991), which produces biased estimates for small samples.

To solve for endogeneity, a variation of Equations (1)–(3) is implemented.

$$Risk_{i,t} = \alpha_{0,i,t} + \alpha_{1,i,t} Risk_{i,t-1} + \alpha_{2,i,t} CSR_{i,t} + \alpha_{3,i,t} Eff_{i,t} + \alpha_{4,i,t} \vartheta_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$Eff_{i,t} = \beta_{0,i,t} + \beta_{1,i,t}Eff_{i,t-1} + \beta_{2,i,t}CSR_{i,t} + \beta_{3,i,t}Risk_{i,t} + \beta_{4,i,t}\vartheta_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$CSR_{i,t} = \gamma_{0,i,t} + \gamma_{1,i,t}CSR_{i,t-1} + \gamma_{2,i,t}Eff_{i,t} + \gamma_{3,i,t}Risk_{i,t} + \gamma_{4,i,t}\vartheta_{i,t} + \varepsilon_{i,t} \quad (3)$$

where

$Risk_{i,t}$: the risk measure of bank i at time t.

$CSR_{i,t}$: the corporate social responsibility score of bank i at time t.

$Eff_{i,t}$: the efficiency score of bank i at time t.

$\vartheta_{i,t}$: the matrix of control variables of bank i at time t.

$\varepsilon_{i,t}$: the random error term.

Table 1 provides a description of all variables, including their definitions and measurement methods.

Table 1. Description of variables.

	Variable	Definition	Measure
Risk	Risk 1	The loan loss reserve ratio.	Reserve for credit losses (asset)/loan
	Risk 2	The non-performing loan ratio	Non-performing loans/oan
CSR	CSR	The overall corporate social responsibility score	$((\sum STR_{CSR}) + (\sum(1 - CON_{CSR})))/total\ number\ of\ CSR\ strenghts\ and\ concerns$
	SCO	The social dimension score	$((\sum STR_{sco}) + (\sum(1 - CON_{sco})))/total\ number\ of\ strenghts\ and\ strenghts\ concerned\ of\ the\ social\ dimension$
	GOV	The governance dimension score	$((\sum STR_{Gov}) + (\sum(1 - CON_{Gov})))/total\ number\ of\ strenghts\ and\ concerns\ of\ the\ governance\ dimension$
	ENV	The environmental dimension score	$((\sum STR_{Env}) + (\sum(1 - CON_{Env})))/total\ number\ des\ strenghts\ et\ concerns\ of\ the\ environmental\ dimension$
Eff	Efficiency	Banking efficiency score	Efficiency technique: the two-step data envelopment method
ϑ	ROA	Return on assets	Net income/average total assets
	CAR	The risk-adjusted capital ratio	Equity/total assets
	CAP	A bank's capital adequacy or financial stability	Equity/assets
	LIQ	The liquidity ratio	Liquidity/total assets
	NIM	The net interest margin	Net margin = (net profit/revenue) × 100
	DIV	Diversification	$1 - \lvert$(net loans − other performing assets)/total performing assets$\rvert$
	SIZE	The size of the bank	The natural logarithm of a bank's total assets

4. Analysis and Interpretation of Results

To determine the interrelation between CSR, efficiency and risk in the American banking sector, we first went through a descriptive, bivariate, and multivariate analysis.

4.1. Descriptive Analysis

Table 2 summarizes the descriptive statistics of the main variables used in our model. We notice that the average efficiency score of our sample is 0.646, with a standard deviation of 0.134. This score is less than 1, so American banks believe they are 64.6% as efficient as the "best" banks.

The average commitment to corporate social responsibility is 0.373, with a standard deviation of 0.114. This score tells us that, on average, the American banks in our sample do not engage too much in socially responsible practices.

The average of Risk 1 of our sample is 0.004 (less than 1%), suggesting that US banks have strengthened their ability to manage risk.

The ratio of non-performing loans (Risk 2) has an average of 0.018, which shows that US banks are managing their risks in the right way.

The bank's average capitalization (CAP), which is measured by the ratio of shareholders' equity to total assets, represents 11.4% and varies between 1.39% and 31.1%. This means that the American banks in our sample have a value above the regulatory threshold

(8%), so they are highly capitalized, i.e., the financial strength of a bank to withstand the shocks of losses is strong.

Table 2. Descriptive statistics of variables.

Variable	Mean	Std.	Min	Max
Risk 1	0.004	0.007	−0.019	0.073
Risk 2	0.018	0.020	0	0.176
CSR	0.373	0.114	0.180	0.723
EFF	6.46	1.34	0	3.57
ROA	0.008	0.006	−0.069	0.039
CAP	0.114	0.025	0.019	0.311
CAR	15.261	3.446	8.2	43.06
LIQ	0.050	0.058	0.002	0.401
NIM	3.559	0.679	0.97	6.27
DIV	0.121	0.473	−8.626	0.785
SIZE	9.333	1.436	6.758	14.779
SCO	0.363	0.106	0.134	0.700
GOV	0.502	0.276	0.103	1
ENV	0.162	0.157	0.103	0.875

Notes: Risk 1: the loan loss reserve ratio; Risk 2: the non-performing loan ratio; CSR: the overall corporate social responsibility score; EFF: banking efficiency score; ROA: return on assets; CAR: the risk-adjusted capital ratio; CAP: a bank's capital adequacy or financial stability; LIQ: the liquidity ratio; NIM: the net interest margin; DIV: diversification; SIZE: the size of the bank; SCO; the social dimension score; GOV: the governance dimension score; ENV: the environmental dimension score.

The average size of the banks that constitute the sample is 9.333, The average ROA is 0.008, the liquidity ratio is 0.05, the net interest margin is 3.55, the diversification is 0.12, and the capital ratio risk-adjusted is 15.26.

4.2. Bivariate Analysis

To detect a possible relationship between the different variables, we present the different correlation coefficients in Table 3.

Table 3. Correlation matrix.

	Risk 1	Risk 2	CSR	EFF	ROA	CAP	CAR	LIQ	NIM	DIV	SIZE	SCO	GOV	ENV
Risk 1	1.0000													
Risk 2	0.6382	1.0000												
CSR	−0.2416	−0.2983	1.0000											
EFF	−0.0277	−0.0592	0.0039	1.0000										
ROA	−0.6011	−0.4276	0.1387	−0.3123	1.0000									
CAP	−0.1255	−0.0624	0.0157	−0.0164	0.2252	1.0000								
CAR	0.1089	0.2128	−0.1280	0.0835	0.0535	0.3147	1.0000							
LIQ	0.0478	0.0571	0.1246	−0.0166	−0.0791	−0.1728	0.1091	1.0000						
NIM	0.1209	0.2018	−0.3013	−0.0427	0.1571	0.2862	0.0763	−0.3698	1.0000					
DIV	0.0436	0.0298	0.0195	−0.5023	0.2095	0.0329	−0.0394	0.0189	−0.2808	1.0000				
SIZE	−0.0073	−0.1391	0.5299	−0.0133	0.0435	−0.0239	−0.1459	0.2467	−0.4143	0.0896	1.000			
SCO	−0.2525	−0.2777	0.8242	0.0067	0.1196	−0.0036	−0.1255	0.1117	−0.2832	0.0217	0.4099	1.000		
GOV	−0.1805	−0.2076	0.6979	0.0081	0.1217	0.0709	−0.1220	−0.1043	−0.0252	−0.0198	0.1613	0.2869	1.0000	
ENV	0.0240	−0.0584	0.4213	−0.0143	0.0081	−0.0686	0.0371	0.3803	−0.3881	0.0617	0.6451	0.2326	−0.0358	1.0000

Notes: Risk 1: the loan loss reserve ratio; Risk 2: the non-performing loan ratio; CSR: the overall corporate social responsibility score; EFF: banking efficiency score; ROA: return on assets; CAR: the risk-adjusted capital ratio; CAP: a bank's capital adequacy or financial stability; LIQ: the liquidity ratio; NIM: the net interest margin; DIV: diversification; SIZE: the size of the bank; SCO; the social dimension score; GOV: the governance dimension score; ENV: the environmental dimension score.

We notice a weak positive correlation (close to 0) between EFF and CSR (0.0039). In contrast, we observe a weak negative correlation (close to 0) between EFF and Risk 1 (−0.0277) and between EFF and Risk 2 (−0.0592). This implies that these variables are not interchangeable and reflect different parameters in reality. Furthermore, we note that CSR is negatively correlated with Risk 1 (−0.2416) and with Risk 2 (−0.2983).

The study of the correlation matrix shows that there is no problem of multicollinearity between the variables of our model.

4.3. Multivariate Analysis

In this section, we show the empirical results derived from the estimations by the system method GMM.

4.3.1. The Impact of CSR and Banking Efficiency on Risk

The results of the study on the impact of CSR and banking efficiency on risk are presented in Table 4. The fundings indicate the existence of a significant negative relationship between the CSR and the loan loss reserve ratio (Risk 1) at the 10% significance level. In particular, an additional CSR commitment leads to a decrease in loan loss reserve risk by about 0.26%. This finding suggests that engaging more in CSR practices is necessary to achieve lower risk levels. This result is supported by the theory of risk management, as the management of CSR practices such as social, environmental, and governance practices create a "moral capital" viewed by the different stakeholders, which leads to a decrease in exposure to financial, social, operational, and environmental risks, thereby reducing the bank's risk (McGuire et al. 1988; Feldman et al. 1997; Sharfman and Fernando 2008).

Table 4. The impact of CSR and banking efficiency on risk.

VARIABLES	(1) Risk 1	(2) Risk 1	(3) Risk 1	(4) Risk 1	(5) Risk 2	(6) Risk 2	(7) Risk 2	(8) Risk 2
L.Risk 1	−0.0671 **	−0.0662 **	−0.0683 ***	−0.0621 ***				
	(0.0262)	(0.0256)	(0.0236)	(0.0236)				
L.Risk 2					0.4979 ***	0.4869 ***	0.4996 ***	0.4841 ***
					(0.0289)	(0.0296)	(0.0289)	(0.0292)
CSR	−0.0026 *				−0.0030			
	(0.0015)				(0.0022)			
SCO		−0.0021				−0.0028		
		(0.0014)				(0.0024)		
GOV			−0.0006				−0.0006	
			(0.0005)				(0.0006)	
ENV				0.0003				−0.0009
				(0.0009)				(0.0011)
EFF	−0.0072 **	−0.0073 *	−0.0098 **	−0.0104 **	−0.0045	−0.0020	−0.0021	−0.0025
	(0.0035)	(0.0043)	(0.0040)	(0.0044)	(0.0068)	(0.0072)	(0.0062)	(0.0073)
ROA	−0.3330 ***	−0.3484 ***	−0.3372 ***	−0.3388 ***	−0.2890 ***	−0.2574 ***	−0.2589 ***	−0.3100 ***
	(0.0398)	(0.0423)	(0.0401)	(0.0420)	(0.0648)	(0.0764)	(0.0536)	(0.0614)
CAP	−0.0177	−0.0064	−0.0245	−0.0209	−0.0525	−0.0553 *	−0.0635 **	−0.0569 *
	(0.0203)	(0.0220)	(0.0174)	(0.0217)	(0.0341)	(0.0333)	(0.0279)	(0.0328)
CAR	0.0003 ***	0.0003 ***	0.0004 ***	0.0004 ***	0.0004 **	0.0004 **	0.0004**	0.0005 ***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
LIQ	−0.0117 *	−0.0156 **	−0.0155 **	−0.0129	0.0162	0.0249 *	0.0099	0.0022
	(0.0069)	(0.0069)	(0.0070)	(0.0084)	(0.0128)	(0.0143)	(0.0138)	(0.0132)
NIM	−0.0021 **	−0.0028 ***	−0.0019 **	−0.0022 **	−0.0040 ***	−0.0038 ***	−0.0030**	−0.0034 **
	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0013)	(0.0014)	(0.0014)	(0.0013)
DIV	0.0019	0.0036	0.0017	0.0018	0.0053	0.0061	0.0049	0.0097 **
	(0.0022)	(0.0023)	(0.0018)	(0.0025)	(0.0043)	(0.0046)	(0.0036)	(0.0045)
SIZE	−0.0009	−0.0015	0.0003	−0.0014	−0.0011	−0.0003	−0.0011	−0.0021
	(0.0016)	(0.0016)	(0.0019)	(0.0018)	(0.0027)	(0.0028)	(0.0034)	(0.0030)
Constant	0.0287 **	0.0359 **	0.0163	0.0327 **	0.0000	0.0000	0.0000	0.0449
	(0.0142)	(0.0139)	(0.0173)	(0.0151)	(0.0000)	(0.0000)	(0.0000)	(0.0272)
Bank effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (2)	0.168	0.166	0.157	0.161	0.149	0.143	0.132	0.184
Hansen J-test	0.273	0.153	0.319	0.353	0.124	0.216	0.170	0.192

Notes: Risk 1: the loan loss reserve ratio; Risk 2: the non-performing loan ratio; CSR: the overall corporate social responsibility score; SCO: the social dimension score; GOV: the governance dimension score; ENV: the environmental dimension score. EFF: banking efficiency score; ROA: return on assets; CAR: the risk-adjusted capital ratio; CAP: a bank's capital adequacy or financial stability; LIQ: the liquidity ratio; NIM: the net interest margin; DIV: diversification; SIZE: the size of the bank; (*), (**), and (***) significant at the 10%, 5%, and 1% level, respectively.

Furthermore, the results suggest that there is no insignificant relationship between CSR and Risk 2, which is measured by the ratio of non-performing loans. In particular, the CSR commitment has no effect on non-performing loans.

The environmental dimension (ENV) does not have a significant impact either on the risk measured by the loan loss reserve ratio (Risk 1) or on the risk measured by the ratio of non-performing loans (Risk 2). These results contradict our fourth hypothesis.

The results suggest the existence of a significant negative relationship between bank efficiency and risk, which is measured by the loan loss reserve ratio at the 5% significance level. In particular, minimizing the risk level determined by the loan loss reserve ratio requires banks to achieve high-efficiency scores. This link aligns with "Slack's theory of Resources" which posits that resource availability (high efficiency) enables banks to invest in CSR initiatives, thereby enhancing their social and environmental performance and reducing risk (McGuire et al. 1988; Waddock and Graves 1997).

Moreover, according to Jeitschko and Jeung (2005), a lower degree of efficiency results in higher costs due to poor credit management and expense regulation. Inefficient management increases risks related to credit, operations, market, and reputation. However, a decrease in risk is the outcome of an improvement in efficiency that is effectively managed.

While bank efficiency reduces the loan loss reserve ratio (Risk 1), no significant relationship is found between bank efficiency and Risk 2, measured by the ratio of non-performing loans. Specifically, variations in efficiency scores do not appear to impact non-performing loans.

The results indicate that ROA has a negative impact on risk, which is measured by the loan loss reserve ratio (Risk 1) at the 1% significance level. In particular, an increase in ROA of one unit decreases the loan loss reserve by approximately 33%.

Besides the negative relationship between ROA and loan loss reserve ratio (Risk 1), the results also suggest the existence of a negative and significant relationship at the 1% level between the ROA and the non-performing loan ratio (Risk 2), with a one-unit increase in ROA leading to a reduction in non-performing loans by approximately 28%.

There is an insignificant link between the capital adequacy ratio (CAP) and the loan loss reserve ratio (Risk 1), indicating that changes in equity do not affect the loan loss reserve ratio. However, the capital adequacy ratio (CAP) has a significant negative impact on the ratio of non-performing loans (Risk 2) at the 10% significant level. Specifically, an increase of one unit in the capital adequacy ratio results in a modest reduction of roughly 5 percent in non-performing loans. This conclusion can be explained by the existence of an information asymmetry problem between the bank and the regulatory authority, which encourages the bank to grow its equity and, hence, lower its risk-taking (Berger et al. 1995).

A significant positive relationship at the 1% threshold between the risk-adjusted capital ratio (RAC) and the loan loss reserve ratio (Risk 1) also links the risk-adjusted capital ratio (CAR) and the non-performing loan ratio. In particular, an increase in the level of risk-adjusted capital ratio (RAC) by one unit increases the loan loss reserve and non-performing loans by approximately 0.03% and 0.04%, respectively. These findings are justified by the elimination of the leverage effect and the implementation of a capital ratio based on the risk-based weighting of each portfolio holding. In fact, these weightings must be designed in such a way that a bank cannot raise the profitability of its capital by adjusting its portfolio because a more profitable and riskier asset must be supported with more capital (Kim and Santomero 1988).

The results show the existence of a significant negative relationship between the liquidity ratio (LIQ) and the loan loss reserve ratio (Risk 1) at the 5% significance level, whereas the relationship between liquidity (LIQ) and non-performing loan ratio (Risk 2) is insignificant. In particular, a variation in the level of liquidity and/or assets has no impact on non-performing loans.

The results show the existence of a significant negative relationship at the 5% threshold between the net interest margin (NIM) and the loan loss reserve ratio (Risk 1), as well as between the net interest rate (NIM) and non-performing loan ratio (Risk 2).

According to the results, diversification (DIV) and bank size (SIZE) have no significant impact on either the loan loss reserve ratio (Risk 1) or the non-performing loan ratio (Risk 2).

The findings reveal that CSR and bank efficiency play significant roles in reducing the loan loss reserve ratio (Risk 1), with CSR linked to a reduction and bank efficiency supporting lower risk levels by enabling resource optimization and strategic investments. The analysis highlights the complex interplay between various bank-specific factors and risk measures. The results underscore the importance of strategic financial management and resource allocation in minimizing risk while recognizing the nuanced effects of different variables.

4.3.2. The Impact of CSR and Risk on Banking Efficiency

Table 5 presents the results of the effect of CSR and risk on banking efficiency. The fundings suggest that the commitment to CSR practices does not have a statistically significant impact on banking efficiency. Therefore, two perspectives support this tiny relationship. One interpretation of this outcome is that US banks have handled investments in a socially responsible manner without impairing their financial performance. The opposite side, however, views this tiny correlation as evidence that bank investment in CSR does not result in financial gain (Soana 2011).

Table 5. The impact of CSR and risk on banking efficiency.

VARIABLES	(1) EFF	(2) EFF	(3) EFF	(4) EFF	(5) EFF	(6) EFF	(7) EFF	(8) EFF
L.EFF	0.2517 ***	0.2738 ***	0.2915 ***	0.2920 ***	0.2229 ***	0.2302 ***	0.2308 ***	0.2456 ***
	(0.0274)	(0.0268)	(0.0282)	(0.0236)	(0.0384)	(0.0347)	(0.0435)	(0.0363)
CSR	0.0101				0.0078			
	(0.0111)				(0.0144)			
SCO		−0.0189				−0.0257 **		
		(0.0126)				(0.0116)		
GOV			0.0063				0.0073	
			(0.0039)				(0.0046)	
ENV				0.0139 *				0.0096
				(0.0078)				(0.0092)
Risk 1	−1.5775 ***	−1.4802 ***	−1.6807 ***	−1.7156 ***				
	(0.2272)	(0.2250)	(0.2328)	(0.2014)				
Risk 2					−0.6493 ***	−0.6561 ***	−0.6862 ***	−0.6773 ***
					(0.1237)	(0.1261)	(0.1377)	(0.1252)
ROA	0.3935 *	0.3246 *	0.2881	0.3239 *	0.5250 **	0.3496 *	0.4064 *	0.3398 *
	(0.2041)	(0.1854)	(0.2052)	(0.1891)	(0.2028)	(0.1936)	(0.2333)	(0.1860)
CAP	−0.4706 ***	−0.4778 ***	−0.3917 ***	−0.4063 ***	−0.4718 ***	−0.4342 ***	−0.4167 ***	−0.4176 **
	(0.1276)	(0.1313)	(0.1143)	(0.1282)	(0.1450)	(0.1448)	(0.1589)	(0.1605)
CAR	0.0051 ***	0.0054 ***	0.0050 ***	0.0053 ***	0.0054 ***	0.0054 ***	0.0051 ***	0.0057 ***
	(0.0006)	(0.0007)	(0.0007)	(0.0006)	(0.0008)	(0.0008)	(0.0008)	(0.0009)
LIQ	−0.6645 ***	−0.6439 ***	−0.6568 ***	−0.6926 ***	−0.6414 ***	−0.6190 ***	−0.6549 ***	−0.6612 ***
	(0.0760)	(0.0764)	(0.0760)	(0.0719)	(0.0874)	(0.0844)	(0.0833)	(0.0822)
NIM	−0.0178 ***	−0.0174 ***	−0.0211 ***	−0.0206 ***	−0.0226 ***	−0.0219 ***	−0.0235 ***	−0.0236 ***
	(0.0043)	(0.0040)	(0.0039)	(0.0039)	(0.0048)	(0.0050)	(0.0051)	(0.0045)
DIV	−0.0309 ***	−0.0339 ***	−0.0344 ***	−0.0374 ***	−0.0386 ***	−0.0390 ***	−0.0389 ***	−0.0444 ***
	(0.0096)	(0.0085)	(0.0085)	(0.0089)	(0.0099)	(0.0092)	(0.0089)	(0.0095)
SIZE	0.0283 ***	0.0274 ***	0.0236 ***	0.0250 ***	0.0143 *	0.0131 **	0.0136	0.0117
	(0.0087)	(0.0086)	(0.0082)	(0.0081)	(0.0076)	(0.0064)	(0.0084)	(0.0072)
Constant	00.0000	0.0000	0.2435 ***	0.2394 ***	0.3799 ***	0.4024 ***	0.3704 ***	0.3911 ***
	(0.0000)	(0.0000)	(0.0784)	(0.0737)	(0.0744)	(0.0682)	(0.0735)	(0.0703)
Bank effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (2)	0.107	0.092	0.087	0.074	0.124	0.139	0.140	0.102
Hansen J-test	0.532	0.642	0.611	0.674	0.473	0.553	0.585	0.547

Notes: EFF: banking efficiency score; CSR: the overall corporate social responsibility score; SCO: the social dimension score; GOV: the governance dimension score; ENV: the environmental dimension score; Risk 1: the loan loss reserve ratio; Risk 2: the non-performing loan ratio; ROA: return on assets; CAR: the risk-adjusted capital ratio; CAP: a bank's capital adequacy or financial stability; LIQ: the liquidity ratio; NIM: the net interest margin; DIV: diversification; SIZE: the size of the bank; (*), (**), and (***) significant at the 10%, 5%, and 1% level, respectively.

In addition, the results show that the social dimension and governance do not have a significant effect on banking efficiency. However, the environmental dimension has a significant positive effect with a threshold of 1%. Indeed, an increase in the environmental score of one unit increases banking efficiency by 1%.

There is a significant negative link between the loan loss reserve ratio and bank efficiency at a threshold of 5%. In particular, a deterioration in the quality of a unit's portfolio reduces the efficiency score by around 15%. Indeed, to have a high efficiency score, the reserve for credit losses must be reduced.

The results show the existence of a significant negative relationship at a threshold of 1% between the ratio of non-performing loans and bank efficiency. In particular, an increase in non-performing loans by one unit leads to a decrease in the efficiency score of approximately 65%. Indeed, to have a better efficiency score, it must reduce non-performing loans.

ROA has a significant positive impact of 10% on banking efficiency. An increase in ROA of one unit leads to an increase in banking efficiency of about 34%. This result is explained by the fact that the most profitable banks are the most efficient.

The results suggest that the capital adequacy ratio (CAP) has a significant negative impact at the 1% threshold on banking efficiency. In particular, an increase in the level of capital adequacy ratio by one unit reduces banking efficiency by approximately 45%.

In addition, the results suggest that the risk-adjusted capital ratio (CAR) has a significant positive impact at a threshold of 1% but low (about 0.5%) on banking efficiency. This conclusion can be justified by the fact that a higher capital ratio leads to higher levels of efficiency because more equity implies less risk taken and has a lower leverage effect, which normally leads to lower borrowing costs (Radic et al. 2011).

The results indicate a significant negative relationship at the 1% threshold between the liquidity ratio (LIQ) and banking efficiency. In particular, an increase in the liquidity ratio of one unit leads to a decrease in banking efficiency of around 65%.

The results also show that there is a significant negative relationship at the 1% level but weak (about 2%) between the net interest margin and bank efficiency.

Diversification has a negative impact at the threshold of 1% but low (about 3%) on banking efficiency.

In addition, the results show the existence of a significant positive link at the 1% level between the size of the bank and its efficiency. In particular, an increase of one unit in total assets by one unit increases banking efficiency by about 2%.

In summary, the results reveal that CSR practices do not exert a statistically significant impact on banking efficiency. This suggests that socially responsible investments by banks neither enhance nor impair their financial performance. However, a closer examination of the individual CSR dimensions reveals a significant positive effect of environmental initiatives on bank efficiency. Regarding risk-related variables, this study demonstrates that poor portfolio quality, as evidenced by higher loan loss reserve ratios and non-performing loans, significantly reduces efficiency scores.

4.3.3. The Impact of Risk and Banking Efficiency on CSR

The results of the estimation of the impact of risk and banking efficiency on CSR are presented in Table 6. The findings reveal a significant negative relationship at the 10% threshold between Risk 1 and CSR. In particular, an upward variation of the loan loss reserve ratio by one unit leads to a decrease in the CSR commitment of around 96%.

Table 6. Impact of risk and banking efficiency on CSR.

VARIABLES	(1) CSR	(3) SCO	(5) GOV	(7) ENV	(2) CSR	(4) SCO	(6) GOV	(8) ENV
L.CSR	0.2624 ***				0.2233 ***			
	(0.0533)				(0.0681)			
L.SCO		0.2407 ***				0.2848 ***		
		(0.0680)				(0.0968)		
L.GOV			0.0584				0.0772	
			(0.0867)				(0.0891)	
L.ENV				0.2715 ***				0.2908 ***
				(0.0164)				(0.0140)
Risk 1	−0.9618 *	−1.5248 **	4.9058 **	−0.1081				
	(0.5475)	(0.7219)	(2.0840)	(0.1939)				
Risk 2					−0.4588 **	−0.5786	0.5676	0.1029
					(0.2124)	(0.4010)	(0.7541)	(0.1400)
EFF	−0.0519	−0.2749 **	1.5197 ***	0.0617	−0.0114	−0.2692 *	1.4330 ***	0.0797 **
	(0.0967)	(0.1161)	(0.3533)	(0.0431)	(0.0990)	(0.1422)	(0.3565)	(0.0401)
ROA	−2.0069 ***	−2.0720 ***	−0.9747	−0.9759 ***	−2.3351 ***	−0.4279	−1.6362	−0.7107 ***
	(0.5219)	(0.6969)	(1.5939)	(0.2031)	(0.4704)	(0.8309)	(1.4917)	(0.1725)
CAP	0.2895	0.7285 *	0.9743	−0.6718 ***	0.5360 **	0.5947	1.4757	−0.4145 ***
	(0.2843)	(0.4114)	(0.8409)	(0.1472)	(0.2687)	(0.5424)	(0.9608)	(0.1576)
CAR	−0.0029	−0.0022	−0.0091	0.0017 **	−0.0033 *	−0.0027	−0.0061	0.0007
	(0.0020)	(0.0024)	(0.0057)	(0.0008)	(0.0018)	(0.0025)	(0.0058)	(0.0008)
LIQ	−0.1294	−0.1568	1.1096 **	0.3170 ***	−0.1354	−0.1690	1.4704 ***	0.2476 ***
	(0.1522)	(0.1695)	(0.5245)	(0.0958)	(0.1490)	(0.2825)	(0.5302)	(0.0891)
NIM	−0.0400 **	−0.0388 **	−0.1158 **	0.0543 ***	−0.0644 ***	−0.0764 ***	−0.0676	0.0353 ***
	(0.0155)	(0.0181)	(0.0511)	(0.0073)	(0.0169)	(0.0247)	(0.0602)	(0.0080)
DIV	−0.0053	−0.0631	−0.0465	0.0425 **	−0.0139	−0.1974 **	−0.0215	0.0312 **
	(0.0234)	(0.0670)	(0.0937)	(0.0166)	(0.0239)	(0.0927)	(0.0850)	(0.0135)
SIZE	−0.0064	0.0120	−0.2466 ***	−0.0390 ***	−0.0459 ***	0.0252	−0.2799 ***	−0.0333 ***
	(0.0199)	(0.0188)	(0.0693)	(0.0098)	(0.0172)	(0.0473)	(0.0707)	(0.0083)
Constant	0.0000	0.0000	0.0000	0.2537 ***	0.0000	0.4304	2.4437 ***	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0894)	(0.0000)	(0.4314)	(0.6978)	(0.0000)
Bank effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR (2)	0.237	0.441	0.078	0.157	0.272	0.303	0.186	0.213
Hansen J-test	0.265	0.228	0.657	0.266	0.270	0.365	0.377	0.654

Notes: CSR: the overall corporate social responsibility score; SCO: the social dimension score; GOV: the governance dimension score; ENV: the environmental dimension score; Risk 1: the loan loss reserve ratio; Risk 2: the non-performing loan ratio; EFF: banking efficiency score; ROA: return on assets; CAR: the risk-adjusted capital ratio; CAP: a bank's capital adequacy or financial stability; LIQ: the liquidity ratio; NIM: the net interest margin; DIV: diversification; SIZE: the size of the bank; (*), (**), and (***) significant at the 10%, 5%, and 1% level, respectively.

In addition, Risk 1 has a significant negative impact at the 5% threshold on the social dimension (SCO). In particular, an upward variation of the loan loss reserve ratio by one unit decreases the level of socially responsible practices by approximately 152%.

However, there is a significant positive link at the 5% threshold between Risk 1 and the governance dimension. In particular, an upward change in the loan loss reserve ratio of one unit leads to an increase in governance practices of around 490%.

Although Risk 1 influences global CSR practices, the social dimension and the governance dimension. However, Risk 1 has no impact on the environmental dimension. In particular, the variation in the level of loan loss reserves has no influence on the commitment to environmentally responsible practices.

The results show the existence of a significant negative relationship at the 5% level between Risk 2 and CSR. In particular, an increase in the ratio of non-performing loans by one unit leads to a decrease in the level of commitment to CSR practices of around 45%.

An insignificant relationship between Risk 2 and the different dimensions of CSR (SCO, GOV, and ENV), i.e., the variation in the level of non-performing loans, has no significant impact on the level of responsible practices socially, nor on the level of environmentally responsible practices and nor on governance practices.

The results suggest that efficiency (Eff) has no significant impact on CSR. In particular, high or low efficiency has no significant effect on the level of commitment to CSR practices.

There is a significant negative relationship at the 5% threshold between banking efficiency (Eff) and the social dimension (SCO). In particular, an increase in the banking efficiency of a unit leads to a decrease in commitment to socially responsible practices of around 27%.

The results show that banking efficiency (Eff) has a significant positive impact at the 1% threshold on the governance dimension (GOV). More specifically, an increase in the level of banking efficiency of a unit generates an increase in governance practices of about 151%.

There is an insignificant relationship between bank efficiency (Eff) and the environmental dimension (ENV). In particular, an upward or downward variation in banking efficiency has no impact on the commitment to environmentally responsible practices.

The results show that ROA has a significant negative impact at the 1% threshold on corporate social responsibility (CSR). In particular, an increase in ROA by one unit leads to a decrease in CSR commitment of around 200%.

The results show that ROA has a significant negative impact at the 1% threshold on the social dimension (SCO), i.e., an increase in ROA by one unit leads to a decrease in commitment to socially responsible practices by approximately 200%.

The results show that ROA has a significant negative impact at the 1% threshold on the environmental dimension (ENV). In particular, an increase in ROA by one unit decreases the level of environmentally responsible practices by approximately 97%.

Although the ROA influences the CSR and the two social and environmental dimensions, it does not affect the dimension of governance. That is to say, the variation of the ROA upwards or downwards has no significant impact on engagement in governance practices (GOV).

The results show the existence of a significant negative relationship at the 1% threshold between the capital adequacy ratio (CAP) and the environmental dimension (ENV). In particular, an increase in the capital adequacy ratio of one unit decreases the level of commitment to responsible environmental practices by approximately 67%.

A significant positive relationship at the 10% threshold between the capital adequacy ratio and the social dimension (SCO) is observed by the results. More specifically, an increase in the capital adequacy ratio of one unit increases the commitment to socially responsible practices by approximately 72%.

The results show that capital adequacy (CAP) has no significant impact neither on overall corporate social responsibility (CSR) nor on the governance dimension (GOV).

The results suggest the existence of a significant positive relationship at the 5% threshold but weak between the risk-adjusted capital ratio (CAR) and the environmental dimension (ENV). In particular, an increase in the risk-adjusted capital ratio of one unit generates an increase in the level of commitment to responsible environmental practices by 0.1%.

More specifically, an upward variation in the liquidity ratio of a unit generates an increase in the level of commitment to governance practices of around 110%.

In addition, the results show that the risk-adjusted capital ratio (CAR) has no significant impact on corporate social responsibility in a global manner (CSR), nor on the social dimension (SCO) and neither on the governance dimension (GOV).

There is a significant positive link at the 1% threshold between the liquidity ratio (LIQ) and the environmental dimension (ENV). In particular, an increase in liquidity and/or a decrease in total assets leads to an increase in the level of commitment to environmentally responsible practices.

In addition, the results show the existence of a significant positive relationship at the 5% threshold between the liquidity ratio (LIQ) and the governance dimension (GOV).

Although the liquidity risk exposure ratio (LIQ) has an impact on the environmental dimension (ENV) and the governance dimension (GOV), it has no effect on the social dimension (SCO) and neither on corporate social responsibility in a comprehensive manner (CSR). In particular, an upward or downward variation in the liquidity risk exposure ratio

has no influence either on the level of commitment to CSR practices or on the level of commitment to especially socially responsible practices.

There is a significant negative relationship at the 5% threshold between the net interest margin (NIM) and the aggregate CSR. In particular, if the net interest margin increases by 1, then it leads to a decrease in the level of commitment to CSR practices by around 4%.

Similarly, there is a significant positive relationship at the 5% threshold between the net interest margin (NIM) and the social dimension (SCO), as well as between the net interest margin (NIM) and the governance dimension (GOV). In particular, an upward variation in the net interest margin leads to a decrease in the level of commitment to socially responsible practices and governance practices, around 3.4% and 115%, respectively.

Although the net interest margin (NIM) influences the aggregate CSR, social dimension, and governance dimension, it does not have a significant impact on the environmental dimension (ENV). In particular, an upward or downward variation in the net interest margin does not influence the level of commitment to responsible environmental practices.

The results show the existence of a significant positive relationship at the 5% level between diversification (DIV) and the environmental dimension (ENV). In particular, an upward variation of the diversification ratio by one unit increases the level of commitment to environmental practices by around 4.2%.

However, although diversification (DIV) influences the environmental dimension (ENV), it has no significant impact on aggregate CSR on the social dimension (SCO) or on the governance dimension (GOV).

The results find an insignificant relationship between bank size and aggregate CSR and between bank size and social dimension (SCO), while the results also show the existence of a significant negative relationship at the 1% level between the size of the bank and the dimension of governance (GOV), and between the size of the bank and the environmental dimension (ENV). In particular, an increase in the size of the bank by one unit generates a decrease in the level of commitment to governance practices and to environmentally responsible practices, approximately 24.6% and 3.9%, respectively.

Ultimately, the findings demonstrate complex relationships between banking risk, efficiency, and corporate social responsibility (CSR). Risk, as measured by both loan loss reserves (Risk 1) and non-performing loans (Risk 2), has a notable influence on CSR practices. Specifically, increased risk, particularly through higher loan loss reserves, is associated with a decrease in CSR commitment, especially in the social dimension. However, a positive link exists between risk and governance practices, suggesting that higher risk levels might incentivize stronger governance. The environmental dimension, however, remains unaffected by risk exposure.

Bank efficiency shows limited overall impact on CSR, though it significantly influences the social and governance dimensions. Increased efficiency appears to reduce socially responsible practices while enhancing governance practices. In contrast, efficiency does not affect environmental responsibility.

5. Conclusions

In this study, we assessed the relationship between CSR, efficiency, and risk in the American banking sector using methods, including the Choquet integral to account for interconnections among variables and a two-step Data Envelopment Analysis (DEA) to measure banking efficiency. Risk was evaluated through the loan loss reserve ratio and the ratio of non-performing loans. By applying the Generalized Method of Moments (GMM) to a dynamic panel of 131 American banks during 2010–2018, our findings reveal that Corporate Social Responsibility (CSR) activities are positively correlated with bank efficiency and contribute to a reduction in credit risk. This indicates that adopting responsible business

practices not only enhances financial performance but also yields positive societal impacts. The results further suggest a virtuous cycle between CSR and risk, as well as between efficiency and risk, highlighting how lower risk levels are associated with greater bank efficiency. However, the relationship between CSR and efficiency exhibits a contrasting "vicious cycle". While CSR and efficiency both positively impact risk, there is no significant direct relationship between CSR and efficiency. Additionally, efficiency negatively correlates with risk, particularly when measured by non-performing loans. Although CSR negatively influences risk across both measures, its direct relationship with efficiency remains insignificant.

These findings emphasize the complex interplay among CSR, efficiency, and risk, underscoring the coexistence of virtuous cycles (CSR and risk; efficiency and risk) and a vicious cycle (CSR and efficiency).

From a theoretical perspective, this study advances the understanding of the multidimensional relationships between CSR, efficiency, and risk in the banking sector. It demonstrates the nuanced interplay between these factors and provides a basis for integrating concepts of financial performance and sustainable practices within a cohesive framework. Furthermore, the use of the Choquet integral and DEA methodologies enriches the existing literature by incorporating more dynamic and interdependent perspectives.

Practically, the findings suggest that banks should carefully manage their CSR initiatives and operational efficiencies to mitigate risks while enhancing their financial performance. Regulators and policymakers can influence these insights to design guidelines that promote sustainable banking practices while safeguarding against unintended inefficiencies or risk exposures.

The findings of this study have important implications for investment practices and policy-making in the banking sector. For banks, CSR should be viewed as a strategic tool for managing credit risk and enhancing operational efficiency. Investments in CSR, such as environmentally sustainable projects or community-focused initiatives, can reduce reputational and financial risks while fostering stakeholder trust. Regulators can leverage these insights to design policies that incentivize CSR adoption, such as incorporating CSR metrics into risk assessments or offering tax benefits to banks with strong CSR performance. For investors, banks with robust CSR practices present an opportunity to align ethical considerations with financial stability, as these banks often exhibit lower risk and greater resilience. By recognizing the interplay between CSR, efficiency, and risk, stakeholders can make informed decisions that promote sustainable banking practices and long-term financial stability.

This study is not without limitations. Overcoming them may open avenues for future exploration. First, by focusing on a single country (the United States), the generalizability of the findings is constrained. Future studies could extend the analysis to multiple countries, particularly comparing developed and developing economies, to better understand the global applicability of the observed relationships and would offer insights into how varying regulatory environments and cultural contexts influence these relationships. Second, our study does not account for the rapid advancements in financial technology (FinTech), which could significantly influence the dynamics between CSR, efficiency, and risk. Incorporating FinTech as a moderating variable in future research would provide valuable insights into its transformative impact on the banking sector. Third, the economic situation can significantly influence bank performance and credit risk, as macroeconomic conditions such as GDP growth, inflation rates, and unemployment levels often shape banks' operational outcomes, risk exposure, and sustainability strategies. Future research could explore the inclusion of economic variables to examine their effects on the relationship between bank efficiency, credit risk, and sustainable development. Additionally, exploring these interactions across

multiple countries over longer periods could help uncover the role of economic cycles in moderating the effects of CSR initiatives on efficiency and credit risk. Such an approach would enhance the generalizability and robustness of findings in this area.

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References

Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 58: 277–97. [CrossRef]

Barnett, Michael L., and Robert M. Salomon. 2012. Does it pay to be really good? Addressing the shape of the relationship between social and financial performance. *Strategic Management Journal* 33: 1304–20.

Baron, David P., Maretno Agus Harjoto, and Hoje Jo. 2011. The economics and politics of corporate social performance. *Business and Politics* 13: 1–46. [CrossRef]

Bauer, Rob, Jeroen Derwall, and Daniel Hann. 2009. Employee relations and credit risk. *Social Scientific Research Network*, 1483112. [CrossRef]

Belasri, Sanaa. 2020. Three essays on CSR performance of banks. *CleRMa-Clermont Recherche Management*, 64–95. Available online: https://uca.hal.science/tel-03623333 (accessed on 16 July 2022).

Belasri, Sanaa, Mathieu Gomes, and Guillaume Pijourlet. 2020. Corporate social responsibility and bank efficiency. *Journal of Multinational Financial Management* 54: 100612. [CrossRef]

Berger, Allen N., and David B. Humphrey. 1997. Efficiency of financial institutions: International survey and directions for future research. *European Journal of Operational Research* 98: 175–212. [CrossRef]

Berger, Allen N., Richard J. Herring, and Giorgio P. Szegö. 1995. The role of capital in financial institutions. *Journal of Banking & Finance* 193: 393–430.

Berger, Allen N., Simona Nistor, Steven Ongena, and Sergey Tsyplakov. 2024. Do "Too-Big-To-Fail" Banks Receive Preferential Treatment in Bailouts? Surprising Results from a Cross-Country Analysis. In *Swiss Finance Institute Research Paper No24-11*. Geneva: University of Geneva, pp. 1–64. [CrossRef]

Blundell, Richard, and Stephen Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115–43. [CrossRef]

Bolton, Brian J. 2013. Corporate social responsibility and bank performance. *SSRN Electronic Journal*, 1–49. [CrossRef]

Bouslah, Kais, Lawrence Kryzanowski, and Bouchra M'zali. 2013. The impact of the dimensions of social performance on firm risk. *Journal of Banking & Finance* 37: 1258–73.

Bouslah, Kais, Lawrence Kryzanowski, and Bouchra M'zali. 2018. Social Performance and Firm Risk: Impact of the Financial Crisis. *Journal of Business Ethics* 149: 643–69. [CrossRef] [PubMed]

Boutin-Dufresne, Francois, and Patrick Savaria. 2004. Corporate social responsibility and financial risk. *Journal of Investing* 13: 57–66. [CrossRef]

Brammer, Stephen, and Andrew Millington. 2008. Does it pay to be different? An analysis of the relationship between corporate social and financial performance. *Strategic Management Journal* 29: 1325–43. [CrossRef]

Branco, Manuel Castelo, and Lúcia Lima Rodrigues. 2006. Corporate social responsibility and resource-based perspectives. *Journal of Business Ethics* 69: 111–32. [CrossRef]

Carnevale, Concetta, and Danilo Drago. 2024. Do banks price ESG risks? A critical review of empirical research. *Research in International Business and Finance* 69: 102227.

Caterina, Di Tommaso, and John Thornton. 2020. Do ESG scores effect bank risk taking and value? Evidence from European banks. *Corporate Social Responsability and Environmental Managment* 27: 2286–98.
Challoumis, Constantinos, and Nicolaos Eriotis. 2024. A historical analysis of the banking system and its impact on Greek economy. *Edelweiss Applied Science and Technology* 8: 1598–617. [CrossRef]
Charnes, Abraham, William Cooper, Arie Y. Lewin, and Lawrence M. Seiford. 1995. Data Envelopment Analysis: Theory, Methodology, and Applications. *Journal of the Operational Research Society* 48: 332–33. [CrossRef]
Chatterji, Aaron K., David I. Levine, and Michael W. Toffel. 2009. How well do social ratings actually measure corporate social responsibility? *Journal of Economics and Management Strategy* 18: 125–69. [CrossRef]
Chollet, Pierre, and Blaise W. Sandwidi. 2018. CSR engagement and financial risk: A virtuous circle? International evidence. *Global Finance Journal* 38: 65–81. [CrossRef]
Choquet, Gustave. 1953. Theory of capacities. *Annales de l'Institut Fourier* 5: 131–295. [CrossRef]
Chouchene, Mohamed Rami, Nihed Mrabet, and Islem Khefacha. 2024. A Fuzzy Approach to Assessing Progress Towards the Sustainable Development Goals Using Choquet Integral Aggregation. In *Sustainable Economic Development*. Edited by Mohamed Sami Ben Ali and Ewa Lechman. Singapore: Springer.
Cooper, William W., Lawrence M. Seiford, and Kaoru Tone. 2006. *Introduction to Data Envelopment Analysis and Its Uses: With DEA-Solver Software and References*. Berlin: Springer Science & Business Media.
Cover, Thomas M., and Joy A. Thomas. 1991. Entropy, relative entropy and mutual information. *Elements of Information Theory* 2: 12–13.
Delgado-Garcia, Juan Bautista, Esther de Quevedo-Puente, and José Maria Diez-Esteban. 2013. The Impact of Corporate Reputation on Firm Risk: A Panel Data Analysis of Spanish Quoted Firms. *British Journal of Management* 24: 1–20. [CrossRef]
Deng, Hepu, Chung-Hsing Yeh, and Robert J. Willis. 2000. Inter company comparison using modified TOPSIS with objective weights. *Computers &Operations Research* 27: 963–73.
El Ghoul, Sadok, Omrane Guedhami, Chuck CY Kwok, and Dev R. Mishra. 2011. Does corporate social responsibility affect the cost of capital? *Journal of Banking and Finance* 35: 2388–406. [CrossRef]
Esteban-Sanchez, Pablo, Marta de la Cuesta-Gonzalez, and Juan Diego Paredes-Gazquez. 2017. Corporate social performance and its relation with corporate financial performance: International evidence in the banking industry. *Journal of Clean Production* 162: 1102–10. [CrossRef]
Feldman, Stanley J., Peter A. Soyka, and Paul Ameer. 1997. Does Improving a Firm's Environmental Management System and Environmental Performance Result in a Higher Stock Price? *The Journal of Investing* 6: 87–97. [CrossRef]
Fengju, Xu, and Assmamawu Wubishet. 2024. Analysis of the impacts of financial development on economic growth in East Africa: How do the institutional qualities matter? *Economic Analysis and Policy* 82: 1177–89. [CrossRef]
Fijałkowska, Justyna, Beata Zyznarska-Dworczak, and Przemysław Garsztka. 2018. Corporate Social-Environmental Performance versus Financial Performance of Banks in Central and Eastern European Countries. *Sustainability* 10: 772. [CrossRef]
Firmansyah, Amrie, and Nafis Dwi Kartiko. 2024. Exploring the association of green banking disclosure and corporate sustainable growth: The moderating role of firm size and firm age. *Cogent Business & Management* 11: 2312967.
Fombrun, Charles J., Naomi A. Gardberg, and Michael L. Barnett. 2000. Opportunity platforms and safety nets: Corporate citizenship and reputational risk. *Business and Society Review* 105: 85–106. [CrossRef]
Friedman, Milton. 1962. *Capitalism and Freedom*. Chicago, IL: University of Chicago Press.
Friedman, Milton. 1970. The social responsibility of business is to increase its profits. *New York Times Magazine* 32: 122–24.
Fukuyama, Hirofumi, and William L. Weber. 2010. A slacks-based inefficiency measure for a two-stage system with bad outputs. *Omega* 38: 398–409. [CrossRef]
Goss, Allen, and Gordon S. Roberts. 2011. The impact of corporate social responsibility on the cost of bank loan. *Journal of Banking and Finance* 35: 1794–810. [CrossRef]
Grabisch, Michel. 1997. Alternative representations of OWA operators. *The Ordered Weighted Averaging Operators: Theory and Applications*, 73–85. [CrossRef]
Gramlich, Dieter, and Nicole Finster. 2013. Corporate sustainability and risk. *Journal of Business Economics* 83: 631–64. [CrossRef]
Haavisto, Venla. 2024. *Does Industry Matter in Terms of ESG? The Impact of ESG on Corporate Financial Performance-Evidence from Europe*. Vasaa: University of Vasaa, pp. 1–87.
Harjoto, Maretno, Indrarini Laksmana, and Robert Lee. 2015. Board diversity and corporate social responsibility. *Journal of Business Ethics* 132: 641–60. [CrossRef]
Harjoto, Maretno A., and Hoje Jo. 2011. Corporate governance and CSR nexus. *Journal of Business Ethics* 100: 45–67. [CrossRef]
Hassan, Abeer, Sehrish Atif, and Jiayi Zhang. 2024. Exploring the Affiliation of Corporate Social Responsibility, Innovation Performance, and CEO Gender Diversity: Evidence from the U.S. *Journal of Risk and Financial Management* 17: 23. [CrossRef]
Hillman, Amy J., and Gerald D. Keim. 2001. Shareholder value, stakeholder management, and social issues: What's the bottom line? *Strategic Management Journal* 22: 125–39. [CrossRef]

Hojer, A., and Virginie Mataigne. 2024. CSR in the banking industry: A longitudinal analysis of the impact on financial performance and risk-taking. *Finance Research Letters* 64: 105497. [CrossRef]
Iannotta, Giuliano, Giacomo Nocera, and Andrea Sironi. 2013. The impact of government ownership on bank risk. *Journal of Financial intermediation* 22: 152–76. [CrossRef]
Istaiteyeh, Rasha, Maysa'A. Munir Milhem, Farah Najem, and Ahmed Elsayed. 2024. Determinants of Operating Efficiency for the Jordanian Banks: A Panel Data Econometric Approach. *International Journal of Financial Studies* 12: 12. [CrossRef]
Jeitschko, Thomas D., and Shin Dong Jeung. 2005. Incentives for risk taking in Banking-A unifed approach. *Journal of Banking and Finance* 29: 739–77. [CrossRef]
John, Kose, Lubomir Litov, and Bernard Yeung. 2008. Corporate governance and risk taking. *Journal of Finance* 63: 1679–728. [CrossRef]
Kim, Daesik, and Anthony M. Santomero. 1988. Risk in banking and capital regulation. *The Journal of Finance* 43: 1219–33. [CrossRef]
Kim, Moshe, Eirik Gaard Kristiansen, and Bent Vale. 2005. Endogenous product differentiation in credit markets: What do borrowers pay for? *Journal of Banking & Finance* 29: 681–99.
Kim, Yongtae, Myung Seok Park, and Benson Wier. 2012. Is earnings quality associated with corporate social responsibility? *The Accounting Review* 87: 761–96. [CrossRef]
King, Andrew. 1995. Avoiding ecological surprise: Lessons from longstanding communities. *Academy of Management Review* 20: 961–85. [CrossRef]
King, Robert G., and Ross Levine. 1993. Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics* 108: 717–37. [CrossRef]
Kojadinovic, Ivan. 2008. Unsupervized aggregation of commensurate correlated attributes by means of the Choquet integral and entropy functionals. *International Journal of Intelligent Systems* 23: 128–54. [CrossRef]
Lins, Karl V., Henri Servaes, and Ane Tamayo. 2017. Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *The Journal of Finance* 72: 1785–824. [CrossRef]
López, M. Victoria, Arminda Garcia, and Lazaro Rodriguez. 2007. Sustainable Development and Corporate Performance: A Study Based on the Dow Jones Sustainability Index. *Journal of Business Ethics* 75: 285–300. [CrossRef]
Luo, Yun, Sailesh Tanna, and Glauco De Vita. 2016. Financial openness, risk and bank efficiency: Cross-country evidence. *Journal of Financial Stability* 24: 132–48. [CrossRef]
Marichal, Jean-Luc, and Marc Roubens. 2000. Determination of weights of interacting criteria from a reference set. *European Journal of Operational Research* 124: 641–50. [CrossRef]
Mattingly, James E., and Shawn L. Berman. 2006. Measurement of corporate social action: Discovering taxonomy in the Kinder Lydenberg Domini Ratings Data. *Business and Society* 45: 20–46. [CrossRef]
McGuire, Jean B., Alison Sundgren, and Thomas Schneeweis. 1988. Corporate social responsibility and firm financial performance. *Academy of Management Journal* 31: 854–72. [CrossRef]
Munda, Giuseppe. 2005. Measuring sustainability: A multi-criterion framework. *Environment, Development and Sustainability* 7: 117–34. [CrossRef]
Neitzert, Florian, and Matthias Petras. 2022. Corporate social responsibility and bank risk. *Journal of Business Economics* 92: 397–428. [CrossRef]
Nelling, Edward, and Elizabeth Webb. 2009. Corporate social responsibility and financial performance: The 'virtuous circle' revisited. *Review of Quantitative Finance and Accounting* 32: 197–209. [CrossRef]
Nizam, Esma, Adam Ng, Ginanjar Dewandaru, Ruslan Nagayev, and Malik Abdulrahman Nkoba. 2019. The impact of social and environmental sustainability on financial performance: A global analysis of the banking sector. *Journal of Multinational Financial Management* 49: 35–53. [CrossRef]
Nollet, Joscha, George Filis, and Evangelos Mitrokostas. 2016. Corporate social responsibility and financial performance: A non-linear and disaggregated approach. *Economic Modelling* 52: 400–07. [CrossRef]
Oikonomou, Ioannis, Chris Brooks, and Stephen Pavelin. 2012. The impact of corporate social performance on financial risk and utility: A longitudinal analysis. *Financial Management* 41: 483–515.
Paradi, Joseph C., and Haiyan Zhu. 2013. A survey on bank branch efficiency and performance research with data envelopment analysis. *Omega* 41: 61–79. [CrossRef]
Porter, Michael E., and Mark R. Kramer. 2006. The link between competitive advantage and corporate social responsibility. *Harvard Business Review* 84: 78–92. [PubMed]
Preston, Lee E., and Douglas P. O'bannon. 1997. The corporate social-financial performance relationship: A typology and analysis. *Business & Society* 36: 419–29.
Radic, Nemanja, Franco Fiordelisi, and Claudia Girardone. 2011. Efficiency and Risk-Taking in Pre-Crisis Investment Banks. *Journal of Financial Services Research* 41: 81–101. [CrossRef]
Roodman, David. 2009. How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal* 9: 86–136. [CrossRef]

Scholtens, Bert. 2008. A note on the interaction between corporate social responsibility and financial performance. *Ecological Economics* 68: 46–55. [CrossRef]
Shane, Philip B., and Barry H. Spicer. 1983. Market response to environmental information produced outside the firm. *Accounting Review* 58: 521–38.
Shapley, Lloyd S. 1953. A value for n-person games. In *Contributions to the Theory of Games, Volume II*. Princeton: Princeton University Press, pp. 307–18. [CrossRef]
Sharfman, Mark P., and Chitru S. Fernando. 2008. Environmental risk management and the cost of capital. *Strategic Management Journal* 29: 569–92. [CrossRef]
Shen, Chung-Hua, Meng-Wen Wu, Ting-Hsuan Chen, and Hao Fang. 2016. To engage or not to engage in corporate social responsibility: Empirical evidence from global banking sector. *Economic Modelling* 55: 207–25. [CrossRef]
Shen, Yanyan, and Xiaojia Zheng. 2024. Exporting corporate social responsibility: Evidence from foreign bank entry. *The British Accounting Review* 56: 101236. [CrossRef]
Simpson, W. Gary, and Theodor Kohers. 2002. The link between social and financial performance: Evidence from the banking industry. *Journal of Business Ethics* 35: 97–109. [CrossRef]
Skana, Pranvera, and Blerina Gjerazi. 2024. Public perception of media social responsibility in developing countries: A case study of Albania. *Frontiers in Communication* 9: 1338587. [CrossRef]
Soana, Maria-Gaia. 2011. The relationship between corporate social performance and corporate financial performance in the banking sector. *Journal of Business Ethics* 11: 104–33. [CrossRef]
Spicer, Barry H. 1978. Investors, corporate social performance and information disclosure: An empirical study. *Accounting Review* 53: 94–112.
Sustainalytics Thematic Research. 2014. *Key Issue Report Series—No. 2: Banks & Responsible Finance*. Amsterdam: Sustainalytics, pp. 1–31.
Tajani, Francesco, Maria Rosaria Guarini, Francesco Sica, Rossana Ranieri, and Debora Anelli. 2022. Multi-criteria analysis and sustainable accounting. defining indices of sustainability under Choquet's integral. *Sustainability* 14: 2782. [CrossRef]
Taskın, Dilvin. 2015. The relationship between CSR and banks' financial performance: Evidence from Turkey. *Yaşar Üniversitesi E-Dergisi* 10: 21–30. [CrossRef]
Verwijmeren, Patrick, and Jeroen Derwall. 2010. Employee well-being, firm leverage, and bankruptcy risk. *Journal of Banking and Finance* 34: 956–64. [CrossRef]
Vishwanathan, Pushpika, Hans van Oosterhout, Pursey PMAR Heugens, Patricio Duran, and Marc Van Essen. 2020. Strategic CSR: A concept building meta-analysis. *Journal of Management Studies* 57: 314–50. [CrossRef]
Waddock, Sandra. 2003. Myths and realities of social investing. *Organization and Environment* 16: 369–38. [CrossRef]
Waddock, Sandra A., and Samuel B. Graves. 1997. The corporate social performance—Financial performance link. *Strategic Management Journal* 18: 303–19. [CrossRef]
Weill, Laurent. 2004. Measuring cost efficiency in European banking: A comparison of frontier techniques. *Journal of Productivity Analysis* 21: 133–52. [CrossRef]
Wolak-Tuzimek, Anna, and Joanna Duda. 2015. Corporate social responsibility as an innovative concept of enterprise management. Paper presented at Basiq 2015: International Conference "New Trends in Sustainable Business and Consumption", Bucharest, Romania, June 18–19; pp. 33–41.
Wu, Meng-Wen, and Chung-Hua Shen. 2013. Corporate social responsibility in the banking industry: Motives and financial performance. *Journal of Banking & Finance* 37: 3529–47.
Wu, Meng-Wen, Chung-Hua Shen, and Ting-Hsuan Chen. 2017. Application of multi-level matching between financial performance and corporate social responsibility in the banking industry. *Review of Quantitative Finance and Accounting* 49: 29–63. [CrossRef]
Zhu, Qinghua, Junjun Liu, and Kee-hung Lai. 2016. Corporate social responsibility practices and performance improvement among Chinese national state-owned enterprises. *International Journal of Production Economics* 171: 417–26. [CrossRef]