



ESG Performance and Bank Valuation: The Influence of the COVID-19 Pandemic on the ESG-Value Relationship

Cranfield School of Management
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Abstract

The thesis examines the relationship between Environmental, Social, and Governance (ESG) performance and banks' valuation metrics, with a focus on how the COVID-19 pandemic impacted this relationship. The fixed-effects panel regression model, using a sample of 71 publicly listed banks across 29 OECD countries from 2015 to 2023, assesses the impact of overall and individual pillar ESG scores on three valuation and performance metrics. These metrics are the Price-to-Book (P/B) ratio, Return on Assets (ROA), and the Price-to-Earnings (P/E) ratio.

The results of the pre-crisis period suggest no statistically significant relationship between ESG performance and valuation. However, COVID-19 had an influence, with results portraying a positive and statistically significant relationship between ESG performance and the P/B ratio and ROA in the post-COVID period. This suggests that investors priced in the resilience impact of strong ESG performance for banks with stronger sustainability during periods of market stress. Further analysis also indicated the ESG effect on valuations was primarily driven by the environmental and governance pillars, with the social pillar remaining statistically insignificant. The results also revealed a non-linear relationship between ESG scores and valuations, with the resilience of the ESG effect being more pronounced for smaller banks.

This study contributes to sustainable finance literature, providing evidence for sector-specific relationships between ESG and value in the banking industry. The results provide important considerations for banks, investors, and regulators, since a strong ESG performance is no longer an asset for reputation but a strong indicator for resilience in banks, especially during periods of crisis.

Keywords:

ESG, bank valuation, COVID-19, sustainability, banking sector, crisis resilience.

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List of Abbreviations

AML	Anti-Money Laundering
CSR	Corporate Social Responsibility
E	Environmental
EMH	Efficient Market Hypothesis
ESG	Environmental, Social, and Governance
EU	European Union
FE	Fixed Effects
G	Governance
GMM	Generalised Method of Moments
NPL	Non-Performing Loan
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
P/B	Price-to-Book
P/E	Price-to-Earnings
RE	Random Effects
ROA	Return on Assets
S	Social
SFDR	Sustainable Finance Disclosure Regulation
VIF	Variance Inflation Factor

1 Introduction

Sustainability has become a cornerstone of banking globally, with an increase in investment decisions and strategic planning driven by Environmental, Social, and Governance (ESG) factors. This shift is critical for banks, which must manage their own ESG risks while integrating sustainability into their capital allocation. The COVID-19 pandemic intensified this pressure, exposing vulnerabilities and accelerating the demand for sustainable growth. The increased relevance is reflected in the growth of global sustainable fund investments, which reached an all-time high of \$3.2 trillion by the end of 2024, and inflows peaked in 2021, recording \$645 billion (Pucci, 2025).

Banks play two roles in the transition to sustainability: managing their ESG risks and impacts and influencing sustainability by financing sustainable projects. This increases the relevance of ESG performance of banks in the view of investors and stakeholders. As banks channel savings into investments, they play a fundamental role in sustainability since they can influence long-term growth and financial system stability (Galletta et al., 2022). However, the question remains whether these sustainability efforts are reflected in the value of banks, with the lack of ESG data and quality regarding materiality and reliability creating a comparability issue among institutional investors (Jonsdottir et al., 2022).

Despite a growing amount of literature attempting to explore the ESG-firm value relationship, there is little focus on the banking sector. The handful of literature mostly focuses on the relationship between ESG and bank valuation and/or risk, such as Azmi et al. (2021), Buallay (2019), Di Tommaso and Thornton (2020), Menicucci and Paolucci (2022), and Rastogi and Singh (2022). Fewer studies have attempted to use COVID-19 as an experiment to examine the effect of a crisis and how it altered investors' views on ESG performance. The majority of studies investigating ESG impact and performance do not focus on the banking industry, such as Albuquerque et al. (2020), Beloskar and Rao (2023), and

Engelhardt et al. (2021). This presents a research opportunity to examine whether the impact of ESG performance on bank valuations has become more pronounced post-pandemic.

The thesis aims to fill the gap by examining the relationship between ESG performance and bank valuation, focusing on whether the relationship is altered by the pandemic. Using a panel dataset of 71 publicly listed banks that are headquartered in OECD countries from 2015 to 2023, the study addresses the following questions. The first is to determine whether there is a relationship between ESG performance and bank valuation, measured by the Price-to-Book (P/B) ratio, Price-to-Earnings (P/E) ratio, and the Return on Assets (ROA). The second is to understand if the COVID-19 pandemic altered this relationship. The third is to investigate if the individual E, S, and G pillars of the score have a differential impact on valuation, particularly during the crisis period.

The study contributes to existing literature through the focus on the banking sector, which is normally excluded from ESG valuation analysis due to its risk profile. Focusing on banks from OECD countries, the thesis provides an insight into how sustainability is priced into the value of the industry. It also contributes through its comparative approach, which examines the relationship between ESG and value before and after COVID-19. This allows for the identification of shifts in investor behaviour concerning ESG and performance. Finally, it contributes through the use of multiple valuation indicators to provide a view of market responses to ESG factors, while controlling for other key variables.

This study follows 6 sections. In the next section, I review the relevant literature and build the hypothesis. Section 3 presents the applied methodology and the data used. Section 4 reports the results. Section 5 discusses the comparisons to earlier work and the contributions made through this study. The study is concluded in Section 6.

2 Literature Review

The relationship between ESG performance and bank valuation has gathered an increasing amount of attention academically, yet gaps remain. Particularly, there are gaps in the analysis of the banking sector and post-COVID-19 contexts. This literature review synthesises the theoretical frameworks, empirical evidence, and gaps that previous literature has failed to investigate in its studies.

2.1 Theoretical Background

Sustainability in banking is an area of academic focus that rests on multiple theoretical foundations that help explain how ESG performance may influence bank valuation. The three theories include the Signalling Theory, the Stakeholder Theory, and the Efficient Market Hypothesis (EMH). They offer a view through which ESG integration in banking can be understood and why it's growing.

Signalling Theory, posited by Spence (1973), suggests firms use disclosures like ESG performance to convey positive information to the market and reduce information asymmetry. In this context, firms use their high ESG scores to signal superior management quality and lower long-term risk, attracting increased investments and improved valuations. The results from the study by Sun et al. (2024) found a positive correlation between positive tones and superior ESG performances, supporting the signalling theory. Giese et al. (2019) and Kim et al. (2014) found that firms with strong social responsibility and high ESG scores are better at managing risks and provide mitigating effects, leading to increased valuation. This sustainability signal becomes more valuable during crisis periods, with stocks possessing strong ESG scores exhibiting lower return volatility and higher returns, making it possible to signal future stock performance (Albuquerque et al., 2020; Beloskar & Rao, 2023). Ersoy et al. (2022) also found that the relationship between the environmental pillar score and US bank market values was an inverted U-shaped relationship, suggesting that the benefits from

signalling plateau beyond an optimal level, which aligns with the theory on credible signals.

Freeman (1984) introduced the Stakeholder Theory, which argues that the firm's responsibility is to create value for all stakeholders and not just shareholders, including customers, employees and society as a whole (Freeman, 1984). As key financial intermediaries, banks face growing scrutiny from stakeholders to act responsibly. Therefore, a bank's commitment to fulfilling its ESG initiatives and acting sustainably can provide multiple benefits, such as supporting long-term valuation, increasing stakeholder trust, improving customer loyalty, and market competitiveness (Kulova & Nikolova-Alexieva, 2023). The benefits of effective stakeholder engagement led to improved shareholder value and earnings (Hillman & Keim, 2001). However, Miranda et al.'s (2023) study found a negative relationship between ESG performance and country-level social trust. Positive social policies in banks have also enhanced customer loyalty, while environmental responsibility provides other benefits such as reduced reputational and regulatory risks. However, Azmi et al. (2021) found no indication that stakeholder theory perfectly explains the relationship between ESG and bank value; rather that some ESG activities provided value to banks, which is consistent with stakeholder theory, but the effect was at a certain threshold.

The Efficient Market Hypothesis (EMH) states that all available information should be priced into asset prices; therefore, all publicly available ESG information should already be incorporated into stock prices. Fama (1970) outlined the strong EMH, that all publicly available information should be priced in fully and immediately. This would imply that the disclosure of ESG activities should not influence their valuation unless disclosing the information would be unexpected or new to the market, so that it alters perceived risk or future cash flows. However, strong-form EMH has been challenged by previous literature, such as Krüger (2015), who found markets underreact to positive ESG performance due to biases from investors or inconsistent ESG reporting, but reacted strongly to

negative events. The idea that some stocks are not fully priced in with these pieces of information suggests it aligns more with semi-strong forms of EMH. This opens the possibility that ESG can be a differentiator in value for banks that disclose in a manner that is timely and credible manner, aligning with the findings of Wong et al. (2020), who found that firms can experience a lower cost of capital and enhanced firm value if they hold an ESG certification.

2.2 ESG and Firm Valuation

There are a number of studies that have explored the relationship between ESG scores and firm valuations, with the majority focusing on non-financial corporations. Friede et al. (2015) investigated over 2000 studies and reported that the majority highlighted a positive relationship between ESG and financial performance. Most of these studies have observed through many periods, some focusing on the financial crisis and some focusing on pre- and post-COVID-19 (Di Tommaso and Thornton, 2020; Giese et al., 2019; Menicucci and Paolucci, 2022; Miralles-Quirós et al., 2019; Rastogi & Singh, 2022; Wong et al., 2020). For instance, Buallay (2019) analysed 235 European banks and found that the vast majority reported a positive relationship between ESG and financial performance, including banks' operational, financial, and market performance. However, he does find that if they are measured individually, the results will vary, with social and governance pillars having a negative effect on ROA and ROE. Friede et al. (2015) found in their studies that 90% of the literature in their sample found a nonnegative relationship between ESG and financial performance, which is the opposite of traditional finance theories that consider social objectives as damaging and companies should only focus on increasing their profits (Friedman, 1970). While most studies focus on non-financial firms, the inference is similarly applied to banks, just through different forms.

For example, non-financial firms that held ESG certificates experienced a lower cost of capital (Wong et al., 2020). Firms with high ESG scores experienced

improved stock returns (Broadstock et al., 2021; Díaz et al., 2021; Engelhardt et al., 2021; Yadav et al., 2024) and reduced volatility (Beloskar and Rao, 2023; Engelhardt et al., 2021). Some literature finds positive relationships between ESG performance and firm valuation, measured by Tobin's Q, return-on-equity, and market-to-book ratios (Albuquerque et al., 2020; Aydogmus et al., 2022; Azmi et al., 2021; Buallay, 2019; Di Tommaso and Thornton, 2020; Miralles-Quirós et al., 2019; Quintiliani, 2022; Rahat and Nguyen, 2024; Rastogi & Singh, 2022). Some of the papers also find that firms that scored highly with ESG measures experienced reduced cost of capital and increased operational efficiencies. However, focusing on the banking sector is less conclusive, where the different business models and regulatory requirements deserve separate investigations. They lack exploration regarding capital structures, risk exposures and regulatory constraints.

Studies such as Díaz et al. (2021) argue that ESG stocks perform better in periods of market turmoil, focusing on periods during COVID-19, with firms possessing high ESG scores outperforming the S&P and firms with low scores. Kim et al. (2014) investigated how CSR, an alternative to ESG, relates to a company's impact on society and the environment, finding that it provided firms with a mitigating effect on the stock price crash, as they investigated between 1995 and 2009. These findings have implications for banks, since stock performance is used as an indicator for valuation. However, the research views financial and non-financial firms the same, obscuring sector-specific insights. Banks need to be isolated to evaluate how ESG factors influence their valuations, especially after the shock of COVID-19 was provided to the market.

2.3 Bank-Specific ESG Issues

Since banks operate differently from non-financial firms in various areas, the effect of ESG performance on valuations may differ. Banks are highly leveraged and operate under strict regulatory oversight, separating their business and risk

models from non-financial institutions (Barth et al., 2004). Their primary assets are intangible, such as loans and financial instruments, which means their reputation and trust are incredibly important in creating value. ESG considerations and sustainability play an important role in influencing the perception of stakeholders, relationships with regulatory bodies, and systematic risk.

Reputational risk is important for banks, as failures in governance, such as AML and unethical lending, can trigger significant reputational damage and financial costs, which in turn reduces firm value (Walter, 2016). Banks that proactively manage climate risk or promote financial inclusion will be less vulnerable to negative publicity. Firms engaging in positive activities can benefit from positive impacts on reputation, helping mitigate potential negative financial impact caused by adverse events (Minor & Morgan, 2011). Findings from Krüger (2015) indicate that investors will respond strongly to negative events and find that positive CSR news can offset the view of investors.

Regulatory scrutiny has become another differentiator in banking, with banks becoming increasingly subjected to ESG-based regulations, such as stress-testing for climate risk and the EU's Sustainable Finance Disclosure Regulation (SFDR). Banks that possess a strong ESG performance can reduce this regulatory friction and enhance their eligibility for green financing programs (Liu et al., 2023). However, compliance costs for banks are usually higher, especially for smaller institutions, since they do not benefit from the substantial economies of scale and the economic benefits from the "too big to fail" status (Bolibok, 2024). The connection between regulation, valuation, and ESG investments remains fairly underexplored in the literature.

Risk management and credit allocation are also vital concerns for banks. They must integrate ESG into their lending decisions, with banks successful in

integration reducing their exposure to carbon-intensive or socially harmful industries, potentially lowering long-term credit risk. Jang et al. (2020) found that ESG provided a mitigating effect of credit risk for smaller firms, and Bonacorsi et al. (2024) suggested through their findings that companies with a large portion of revenues tied to carbon emissions faced higher credit risk, whereas companies hiring skilled workers or situated in stricter carbon regulation regions possessed lower credit risk. Previous literature has shown that banks with portfolios that are ESG-oriented and socially responsible investments tend to perform better during a time of turmoil, although more research is needed to understand the valuation impact (Weber et al., 2012).

2.4 Impact of COVID-19 on Financial Markets

The COVID-19 pandemic negatively impacted the markets by introducing unprecedented volatility and forced companies to re-evaluate risk frameworks, particularly in banking. A growing body of literature finds that ESG gained prominence during the crisis, with Savio et al. (2023) finding an increase in the production of ESG topics in the same period of COVID-19, indicating a heightened awareness of ESG among academics. The growing attention increased the view by investors that ESG is a strong indicator for resilience and long-term valuation. Bressan and Weissensteiner (2024) and Gao and Geng (2024) found firms and banks with high ESG scores rebounded at a faster rate after COVID-19 and displayed more resilience. However, a study by Demir and Danisman (2021) found ESG scores had no impact on stock returns or intensified negative stock price reactions. Reising (2023) also witnessed improvements in ESG around the pandemic did not improve valuation, but it was associated with lower risk.

Additionally, the crisis accelerated the expectations from stakeholders surrounding the topic of sustainability. Banks were found to be under increased pressure to support communities that were struggling, promote financial

inclusivity, and align lending with their environmental goals, with the increased recognition of environmental protection that has been exerted on firms (Gangi et al., 2018). Banks that demonstrated their ESG leadership during the period saw enhancements in reputation, which improved their valuation metrics. The importance of a strong reputation in a crisis, through customer and investor loyalty, was seen in Albuquerque et al. (2020) results, where firms with strong ES ratings had greater valuations. However, few studies have assessed the difference in the impact of ESG on bank valuation before and after COVID-19. For example, Yuen et al. (2022) studied how ESG and its components influenced bank profitability globally with consideration of COVID-19, and Beloskar and Rao (2023) investigated ESG performance in the Indian market before and after COVID-19. The thesis aims to add to this developing area of research.

COVID-19 has created an exogenous shock that serves as a natural experiment to examine the role of ESG in firm valuation. If ESG scores are more positively correlated with valuation after the COVID-19 period, this would support the argument that markets have begun to believe sustainability is a key determinant of financial health.

2.5 Gap in Literature

Despite the growth of ESG literature, significant gaps remain for banking. The key gaps are:

- **Sector specificity:** Many empirical studies choose a broader sample, incorporating non-financial firms with financial. This limits generalisability since banks have unique risk profiles, capital structures and regulations.
- **Crisis dynamics:** The limited research focusing on the period before and after COVID-19 results in limited evidence on whether systemic stress can alter the market pricing of ESG scores on banks.

- Pillar heterogeneity: Conflicting evidence between the individual pillars of ESG warrants further divided analysis. Some studies have suggested that social and governance factors carry more weight (Aydogmus et al., 2022), while others highlight the importance of environmental performance (Díaz et al., 2021; Menicucci and Paolucci, 2022; Miralles-Quirós et al., 2019).
- Inconsistent measurement: There are differences across the providers of ESG scores, with huge differences in scoring and measurements (Galletta et al., 2022). This increases endogeneity concerns between valuation and ESG performance, which limits the causal inference in banking samples.

To respond to these issues, the thesis uses a bank-only sample, analysing pre- and post-COVID periods, disaggregating the individual pillars, and acknowledging the limits of measurement and endogeneity.

2.6 Hypotheses

Based on the literature and theoretical frameworks reviewed, a conceptual framework appears. Strong ESG performance, enhancing bank value through the reduction of information asymmetry and stakeholder trust, is suggested by Signalling Theory and Stakeholder Theory. However, the benefits not being consistently priced in by investors are implied by the Efficient Market Hypothesis. Evidence from literature provides mixed views, but it does point towards the role of ESG transforming into a significant indicator of resilience during systemic shocks, such as COVID-19.

The Signalling and Stakeholder theories, along with empirical evidence, imply ESG can be viewed as a credible resilience signal that helps to lower information asymmetry and risk. Prior studies find a positive link between ESG and valuation, therefore:

H1: ESG scores are positively associated with bank valuation metrics.

The pandemic increased market uncertainty, along with a focus on risks and corporate resilience from investors. The mechanisms of Signalling and Stakeholder theory make strong ESG performance more valuable, and with semi-strong EMH, information should be repriced by investors. Therefore:

H2: The positive effect of ESG scores on bank valuation has strengthened post-COVID-19.

Previous literature suggests the individual pillars of ESG have different impacts on bank valuation. Investors view different pillars with different effects in various periods of risk and performance. Therefore, the third hypothesis is:

H3: The individual pillars of ESG have different impacts on bank valuation.

If the impact of ESG performance strengthens post-COVID, then so should the pillars. The Signalling and Stakeholder theory, along with semi-strong EMH, implies the crisis may have strengthened the pillar effects. Therefore:

H4: The relationship between the individual pillars of ESG and the valuation metrics strengthened after COVID-19.

In order to test these hypotheses, a panel regression model is used. ESG scores and valuation metrics for a sample of global banks in OECD countries,

segmented into pre- and post-COVID periods. COVID is treated as a structural break, and due to the consistency of signs and magnitudes across the subsamples, it indicates inferences are insensitive to modest shifts in the cut-off. The contribution this study will provide to the literature is offering sector-specific insights and evaluating the changes in ESG relevance.

3 Data and Methodology

3.1 Research Design

The study uses a quantitative, panel data fixed-effects regression model to investigate the impact of a bank's ESG performance on its valuation from 2015 to 2023. This approach controls for unobserved, time-invariant bank-specific heterogeneity and examines temporal dynamics. The effect of ESG on valuation from potential factors, such as corporate culture or management quality, is isolated and accounting for this ensures the results of the model are not affected by the unobserved characteristics (Wooldridge, 2010). This method aligns with the Stakeholder Theory, which predicts that unobserved bank-specific attributes influence their valuations. The model's ability to detect the temporal shifts in the ESG-valuation relationship is enhanced by including the yearly fixed effects, capturing macroeconomic cycles and sector-wide shocks, such as the COVID-19 pandemic.

The design of this research uses the COVID pandemic as a quasi-natural experiment, using the year 2020 as the chosen point between the pre- and post-COVID period. The World Health Organization (2020) declared COVID-19 a pandemic in March 2020 and reported the first rise of cases in January 2020. From March 2020, there were widespread economic disruptions from major lockdowns and changes in regulatory guidance on ESG disclosures. However, this approach does acknowledge that COVID-19 was not a single event and was a staggered economic event, but 2020 serves as a clear turning point. The disruptions caused by COVID-19 represent an exogenous shock to financial markets, which provides a robust basis to test whether the ESG-valuation relationship was structurally altered.

The research design contains a core component that considers the threat of causal inference. The challenge of causal inference is endogeneity, which arises from reverse causality, for example, if firm valuation enables greater investments

in ESG and omitted variables. To prevent these issues, the study incorporates a lagged ESG score to mitigate simultaneity bias and uses a fixed-effects model controlling for time-invariant omitted variables. Utilising these methods, the robustness of the findings is enhanced, along with the conclusions presented as associations rather than definite causal claims. The methodology is consistent with previous literature focusing on sustainable finance, which also sought to identify the relationship between ESG and value within the banking sector (Buallay, 2019; Menicucci and Paolucci, 2022).

3.2 Sample Selection

The panel dataset used in this study was originally populated with 78 banks headquartered in OECD countries. Focusing on these countries was done to enhance the internal validity of the results by ensuring homogeneity across the sample, specifically in terms of financial regulations and financial reporting standards. The specific focus on the area will increase the quality and comparability of the data. The initial dataset was refined through multiple criteria in order to remove any issues. The criteria consisted of three conditions: the first was that they must be publicly listed across the entire sample period (2015-2023). The second was that their ESG and financial metrics that are used in the study must be available on Refinitiv. Finally, the third criterion was that any banks that went through a merger or acquisition during the period of the sample, resulting in a change in total assets exceeding 10% year-on-year, were removed to avoid any potential data distortions. After applying the criteria, the final panel dataset consisted of 71 banks across 27 OECD countries, which are detailed in Table 3-1. However, the choice of OECD countries does limit the validity to emerging markets, where the disclosure quality and regulatory regimes differ.

The Refinitiv Eikon database was the primary choice to collect the data for the valuation metrics, ESG scores, and control variables. Any information that was missing from the Refinitiv database was replaced with information from the banks

themselves. Refinitiv was used for ESG ratings due to its detailed data regarding individual pillars compared to Bloomberg ESG reporting and the S&P ESG rating (Galletta et al., 2022). This is because Bloomberg focuses on transparency, and the S&P is weighted for firms based on their industry. Refinitiv has been used in previous studies, such as Engelhardt et al. (2021) and Menicucci and Paolucci (2022). The dependent variables include Price-to-Book Ratio (P/B), Return-on-Assets (ROA), and Price/Earnings ratio. The control variables include Bank Size (log assets), NPL Ratio, Capital Adequacy (Tier 1 ratio), the loan-to-deposit ratio, and the cost-to-income ratio. Despite the advantage of comparability when focusing on OECD countries, regional heterogeneity may influence ESG practices. To control for this, fixed effects and subsample analysis are used.

Table 3-1 Banks' distribution across the OECD countries

Country	NO. of Banks	Country	NO. of Banks
USA	10	Japan	4
United Kingdom	5	South Korea	4
Germany	2	Turkey	3
France	3	Hungary	1
Netherlands	2	Belgium	1
Spain	3	Poland	2
Italy	3	Czech Republic	1
Switzerland	1	Austria	2
Australia	4	Chile	2
Canada	5	Israel	2
Finland	1	Greece	3

Sweden	2	Mexico	1
Denmark	1	Ireland	2
Norway	1		

3.2.1 Data Collection and Cleaning

The final dataset resulted in 639 bank-year observations from 71 banks. Before the data could be used for testing, some preparation and cleaning were needed to ensure consistency and robustness. The first was to align the fiscal years since some Korean banks did not have aligned fiscal years with the calendar years, so they were adjusted to the nearest calendar year. In order to remove the potential for extreme values in the data influencing regression results, all continuous variables were winsorised at the 1st and 99th percentiles. To ensure the values of the variables were uniform and accounted for the effects of inflation over the period of the sample, the monetary values for all the banks were converted to the US dollar year-end exchange rates. To handle missing data, if any bank-year observation was missing more than three missing control variables, they were excluded from the regression sample to maintain the integrity of the estimates. Banks such as Íslandsbanki hf. and Banco del Bajío were removed since they had incomplete data for the essential variables.

3.3 Variables

Table 3-2 Summary of Variables. Including explanation, formula, expected signs, and sources

Variable	Description	Formula	Expected Sign	Source
<i>Valuation Metrics</i>				

Price-to-Book	Market value relative to book value	Market Value ÷ Book Value		Aras and Hacıoglu Kazak (2022)
ROA	Measure of operational profitability	Net Income ÷ Total Assets		Aydogmus et al. (2022); Buallay (2019)
P/E Ratio	Market price per share divided by earnings per share	Price ÷ Earnings Per Share		Fama and French (1992)
ESG Variables				
ESG Score	Score given by Refinitiv	Combined ESG score (0-100)	+	Engelhardt et al. (2021); Menicucci and Paolucci (2022)
Lagged ESG score	ESG score that is lagged by one year to address reverse causality	ESG score from the previous year	+	Rahat and Nguyen (2024)
Interaction Terms				
PostCOVID	Dummy variable that is 1 for 2020-2023 and 0 otherwise	Dummy: 1 for 2020-2023	+/-	

ESGScore x PostCOVID	Interaction term between ESG and PostCOVID dummy	Dummy: 0 for otherwise	+/-	
Control Variables				
Bank Size	Larger banks may experience economies of scale from ESG investments	Log of total assets	+	Albuquerque et al. (2020); Broadstock et al. (2021)
Leverage	Banks with high debt may not be able to spend on ESG investments	Total debt ÷ Total assets	+/-	Albuquerque et al. (2020); Broadstock et al. (2021)
NPL Ratio	This can be measured as credit risk, which ESG may be able to reduce	Non-performing loans ÷ Total loans	-	Berger and Mester (1997)
Loan-to-deposit ratio	Indicator of liquidity	Total loans ÷ Total Deposits	-	Athanasoglou et al. (2008)
Cost-to-income-ratio	Reflects operational efficiency	Operating costs ÷ Operating income	-	Hess and Francis (2004)

Capital Adequacy	Captures regulatory Resilience	Tier 1 capital ratio	+	Berger and Bouwman (2013)
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3.3.1 ESG Indicators

The ESG indicators were sourced from the Refinitiv Eikon database, whose methodology aggregates over 450 individual ESG measures into 10 categories. They are then split into three different pillar scores and then weighted into a final ESG score. For the banking industry, these weights are adjusted to reflect the uniqueness of the sector. All the scores, as well as the individual ESG pillar scores, are presented on a scale of 0 to 100, with higher values indicating a better performance.

A lagged ESG variable and lagged individual pillar scores were included in the model specification, which used the score from the previous year. Utilising this technique helps to mitigate potential endogeneity issues, specifically simultaneity bias. The reason behind this is that there is a possibility that it takes a period of time for investors and stakeholders to fully recognise and price in a company's ESG performance.

3.3.2 Dependent Variables

The study uses three different dependent variables to assess bank valuation for robustness. Through this approach, the study can capture the investors' perception of the value and operational performance, offering a broad view of how ESG may create value for banks. The variables chosen for this study are the price-to-book (P/B) ratio, the price-to-earnings (P/E) ratio, and the return on assets (ROA).

The price-to-book ratio will represent the market value to book value and serves as a widely accepted indicator for investors' perception of the bank's worth relative to their tangible assets. The variable reflects the investor sentiment and how they believe companies will grow in the future relative to their account worth (Damodaran, 2012). The price-to-earnings ratio reflects the market's expectations of the potential future earnings of the banks, since it captures the willingness of investors to pay for a share. If the P/E ratio is high, this indicates that investors anticipate stronger future earnings growth, making it a signal for perceived sustainability and growth potential (Gottwald, 2012). Including ROA with the two-valuation metrics of P/B and P/E can provide an idea of whether ESG creates real value from improved efficiency, leading to higher ROA. It is an indicator of operational efficiency and the bank's ability to generate profits from its assets (Istaiteyeh et al., 2024). Including the ROA provides an avenue to assess whether any improvement in valuation associated with ESG is caused by improvements in operational performance.

3.3.3 Control Variables

The inclusion of the control variables [Table 3-2] is to isolate the effect of ESG performance on bank valuation, as it is important to control for the other determinants of financial performance and market value of banks. Previous literature, such as Albuquerque et al. (2020) and Broadstock et al. (2021), uses various bank-specific control variables incorporated into the regression models to account for bank size, profitability, liquidity, capitalisation, and risk.

Bank size, which is measured by the natural logarithm of total assets, will control for scale effects, understanding how they benefit from economies of scale and their greater allocation of resources. Profitability, which is measured by the cost-to-income ratio, can account for operational efficiency. A stronger financial performance can also improve their valuation, so it is important to remove this effect from the study. The loan-to-deposit ratio measures liquidity, since banks

with higher ratios may be viewed as riskier by investors, damaging their valuation and preventing them from investing in long-term ESG initiatives. The Tier 1 capital ratio accounts for capital adequacy, which controls for regulatory resilience. Banks that contain large amounts of capital usually can absorb shocks better, which may increase the confidence of investors. Leverage, which is calculated as total debt to total assets, will control for financial risk. Banks with higher leverage may see higher returns, but also may be more vulnerable in economic downturns, such as COVID-19, potentially removing the benefits of strong ESG performance. The NPL ratio measures asset quality and is used to measure credit risk. Banks with high levels of NPLs can indicate poor asset quality, negatively impacting profitability and market valuation.

3.4 Model Specification

To test the previous hypotheses, the study uses a fixed effects panel regression model. The fixed-effects model is justified theoretically and empirically as the most suitable approach to control for unobserved heterogeneity and isolate the effect of ESG performance on bank valuation, supported by the Hausman specification tests (found in Section 5.4).

3.4.1 Baseline Model for Overall ESG Score

To test for the first and second hypotheses (H1 and H2), the following model is used:

$$\begin{aligned}
 &ValuationMetric_{i,t} && (4-1) \\
 &= \alpha_i + \beta_1 ESGScore_{i,t} + \beta_2 ESGScore_{i,t-1} + \beta_3 PostCOVID_t \\
 &+ \beta_4 (ESGScore_{i,t} \times PostCOVID_t) + \gamma X_{i,t} + \epsilon_i
 \end{aligned}$$

Where the dependent variable, $ValuationMetric_{i,t}$, measures for bank i in period t (P/B ratio, ROA, and P/E ratio). The α_i is the bank-specific fixed effect to control

for the time-invariant bank characteristics. $ESGScore_{i,t}$ is the ESG score of bank i at time t , with $ESGScore_{i,t-1}$ being the lagged ESG score to address endogeneity. $PostCOVID_t$ is the dummy variable, equal to 1 for years 2020 onwards, and $ESGScore_{i,t} \times PostCOVID_t$ is the interaction term to capture how the ESG effect changes after COVID-19. Finally, $X_{i,t}$ are the control variables (Bank Size, NPL Ratio, Leverage, Loan-to-Deposit ratio, Cost-to-Income ratio, and Capital Adequacy).

Regarding the coefficients, β_1 represents the strength the ESG score has on the individual valuation metric before COVID-19, β_2 is the strength of the ESG score of the previous year on the individual metric before COVID-19, β_3 measures whether the valuations were higher or lower after COVID, independent of ESG, the interaction term of β_4 represents the effect of ESG scores on the valuation metric has strengthened or weakened after COVID.

3.4.2 Individual Pillar Models

To test the other two hypotheses, H3 and H4, Equation 1 is adapted by replacing the overall ESG and lagged score with the individual pillars of ESG and the respective interaction terms in different regression models.

3.4.3 Non-Linear Model

Testing for a non-linear relationship between ESG and bank valuation, an additional model is used. This model includes a squared ESG score, which tests for a U-shaped or inverted relationship, to investigate whether the effects of ESG are not constant across different levels of performance.

3.4.4 Bank Size and Period-Specific Model

To explore heterogeneity in the results, the baseline model is used. The first version will split the sample by bank size to test if the relationship is dependent on size. The second splits the sample between pre- (2015-2019) and post-COVID (2020-2023), removing the Post-COVID dummy variable and interaction term from the baseline model.

3.5 Robustness Tests

To validate the results of the tests, several robustness tests are performed, including the Hausman Test, Breusch-Pagan LM Test, the Variance Inflation Factor (VIF), the Ramsey RESET Test, and the Wald Test. The use of standard errors clustered at the bank level adjusts the variance-covariance matrix of the estimators, which accounts for potential heteroskedasticity and autocorrelation within each bank's observations over time. This would make the results of the hypothesis tests more reliable.

The Hausman test will justify the choice of the fixed-effects model over the random-effects model, assessing whether unobserved time-invariant bank-specific effects are correlated with the regressors in the model. To test for random effects, the Breusch-Pagan Lagrangian Multiplier is employed, also justifying whether panel data is preferred over a Pooled OLS regression. The VIF is calculated for the predictors to test for multicollinearity among the independent variables. The Ramsey RESET Test investigates potential model misspecification, with a manual version chosen, which is done by including the squared fitted values of the dependent variable as an additional regressor. The Wald test assesses the joint significance between the ESG score and the interaction term, determining the overall combined impact of the ESG score post-COVID.

4 Results

4.1 Descriptive Statistics

Table 4-1 shows the descriptive statistics of the main variables in the sample and used in the panel data regression. The dataset is based on 639 observations across the time period 2015 to 2023.

Table 4-1 Descriptive statistics of variables: panel data across the period 2015-2023

Variable	Mean	Median	Std. Dev.	Min	Max
ESG Score	74.176	75.904	12.211	28.196	95.681
E Score	80.301	84.838	16.908	12.261	98.982
S Score	77.538	79.489	12.631	24.918	97.656
G Score	69.274	72.000	18.837	12.857	99.208
Price to Book	1.000	0.886	0.606	0.003	5.777
Return On Assets	0.007	0.007	0.007	-0.038	0.052
PE Ratio	25.844	10.371	337.077	-314.920	8500.000
Bank Size	13.015	13.225	1.185	10.487	15.170
Leverage	0.177	0.153	0.130	0.001	0.804
NPL Ratio %	3.894	2.192	6.555	0.037	63.323
Loan to Deposit Ratio	0.905	0.850	0.298	0.067	2.075
Cost-to-Income Ratio	1.881	1.778	13.353	-295.552	77.399

Capital

Adequacy %	15.156	14.600	3.122	9.040	31.700
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In our sample, the average ESG score is 74.176, with a standard deviation of 12.211, indicating there is a spread across the sustainability performance across the banks. The average environmental (E) score is higher than both social (S) and governance (G), with a score of 80.301, and G and S being 77.538 and 69.274. This indicates that banks may have a greater emphasis on improving their environmental and social score rather than on governance.

The average price-to-book (P/B) ratio is 1.000, with the maximum and minimum values ranging from 5.777 to 0.003, indicating a large variation. The price-to-earnings ratio (P/E) reflects how the banking sector experiences volatile earnings, displaying a large standard deviation. However, through the winsorisation of the values, the influence of outliers can be mitigated. The indicator of operational efficiency, return on assets (ROA), is low but stable, with an average of 0.007.

Since the data is a panel, the regression model does not have a strict assumption of normality. The FE estimators are robust to deviations, so normality does not affect the results and will allow for the bank's unobserved time-invariant heterogeneity. The fixed effects model is supported over OLS or random effect since the standard deviations within banks over time indicate a meaningful group variation.

Table 4-2 shows the calculated correlation coefficients, including all the dependent variables, ESG-related variables, and control variables. The P/B and ROA are positively correlated, while ROA and P/E possess a very weak

relationship; this potentially could be due to high variance in earnings and extreme outliers in P/E. The overall ESG scores reflect the individual pillars, showing positive correlations with all the pillars. The weak positive correlation between ESG and ROA, P/E, and P/B suggests that the valuation metrics may not respond strongly to ESG headlines alone. However, the environmental scores are positively correlated with P/B, which suggests that banks that invest environmentally may be rewarded. Governance and social scores are both weak and negatively correlated with valuation metrics. The control variables and ESG experience low correlation; however, bank size is positively correlated with ESG, implying that larger banks possess ESG scores due to larger resources.

The low correlation between independent variables will reduce the concerns of multicollinearity, and this is further addressed in the robustness tests using the variance inflation factors (VIF).

Table 4-2 Correlations between the variables

Size	Lev	NPL	LtD	Ctl	cap ad
1					
0.1748	1				
-0.2942	-0.1945	1			
-0.3015	0.1476	0.0010	1		
-0.0242	-0.0199	0.0876	-0.0231	1	
-0.0237	0.3380	-0.0392	-0.0295	-0.0448	1

Variables	P/B	P/E	ROA	ESG	E	S	G
P/B	1						
P/E	-0.0591	1					
ROA	0.3946	-0.0445	1				
ESG	-0.2090	-0.0180	-0.1299	1			
E	-0.2443	0.0030	-0.1018	0.6049	1		
S	-0.0980	-0.0384	-0.0233	0.7966	0.4914	1	
G	-0.1683	0.0134	-0.1680	0.7556	0.2239	0.2586	1
Bank Size	-0.0726	-0.0558	-0.2773	0.4439	0.4152	0.2548	0.3622
Leverage	0.3790	-0.0309	0.0954	-0.1408	-0.0975	-0.1740	-0.0469
NPL Ratio	-0.2775	0.3586	-0.3429	-0.1120	-0.0579	-0.0852	-0.0614
LtD	-0.1006	-0.0005	0.0636	-0.0937	0.0384	-0.0984	-0.0838
Ctl	-0.0149	0.2065	0.0396	-0.0342	-0.0166	-0.0140	-0.0315
Capital Ad.	0.1782	0.0225	0.0503	-0.0634	-0.0483	-0.1222	-0.0041

4.2 Panel Regression Results

4.2.1 ESG and Bank Value

The main regression results (Table 4-3) provide no support for Hypothesis H1. The coefficients for the current and lagged ESG scores are statistically insignificant across all models, with low magnitudes for P/B (-0.0003), P/E (0.0434), and ROA (-0.0000). This aligns with Menicucci and Paolucci (2022), who also reported the ESG combined value being an insignificant predictor for ROA. These results imply that ESG scores have a weak influence on the value of banks or operational efficiency during periods of no disruptions. This is

consistent with Giese et al.'s (2019) studies, who argued that ESG performance takes a relatively long time before it can be used as an investment signal.

Table 4-3 Panel regression results for overall ESG score with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	-0.0003 (0.002)	0.0434 (0.103)	-0.0000 (0.000)
Lagged ESG Score	-0.0004 (0.002)	-0.1248 (0.127)	-0.0000 (0.000)
Post-COVID	-0.4780*** (0.172)	2.7230 (4.167)	-0.0078*** (0.003)
ESG × Post-COVID	0.0037* (0.002)	-0.0501 (0.054)	0.0001** (0.000)
Bank Size	-0.0159 (0.085)	-1.6226 (2.396)	0.0003 (0.002)
Leverage	0.0845 (0.668)	-13.0748 (21.370)	0.0162* (0.010)
NPL Ratio	-0.0074*** (0.003)	0.3302 (0.227)	-0.0002*** (0.000)
Loan-to-Deposit	-0.3220* (0.199)	-13.3075* (7.707)	-0.0111** (0.004)
Cost-to-Income	0.0001 (0.000)	0.0401 (0.026)	0.0000*** (0.000)
Capital Adequacy	0.0092 (0.008)	0.2960 (0.223)	0.0006*** (0.000)
Constant	1.5001 (1.023)	47.5140 (31.235)	0.0050 (0.022)
Observations	568	568	568
R-squared (Within)	0.182	0.056	0.172

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

However, the interaction term, ESGxPost-COVID, was a positive predictor of P/B and ROA at 0.10 and 0.05 significance levels, respectively ($p=0.072$ and $p=0.036$). Post-COVID, an increase of 1 in ESG score is associated with a 0.37% increase in P/B and 0.01% in ROA. This suggests the post-COVID market value and asset efficiency are positively affected by ESG performance, supporting the idea that ESG enhances institutional resilience in crisis. The findings also strongly support hypothesis H2, which states that a positive effect of ESG would strengthen post-COVID. The findings are consistent with Broadstock et al. (2021) and Albuquerque et al. (2020), whose research highlighted that strong ESG credentials had countercyclical values in crisis environments. The results imply investors recognise the risk-mitigating properties of strong sustainability practices in times of crisis.

Contrarily, the interaction term for the P/E ratio is not significant ($p=0.352$), suggesting that after the pandemic, earnings in the long term were not influenced by ESG ratings. This likely reflects the extreme volatility in bank P/E ratios during 2020-2021.

Concerning the control variables, NPL ratio is significantly and negatively influencing both P/B ($p=0.004$) and ROA at a 0.01($p=0.004$) significance level, confirming that it is a good proxy for credit risk. The loan-to-deposit ratio is significant across all models, negatively impacting all the dependent variables. This indicates that banks that have aggressive lending strategies may be experiencing lower values or profitability. Cost-to-income ratio and capital adequacy have a significant relationship with ROA, confirming the importance of bank efficiency and resilience.

The post-COVID dummy variable is also significant for P/B ($p=0.007$) and ROA ($p=0.008$) at a 0.01 significance level, suggesting a drop in valuations and profitability after the pandemic. However, the ESG acts as a buffer, with the interaction effect being mitigated.

The R-squared values, which measure the explanatory power of the regression models, range across the 3 models. The R-squared values of the P/B and ROA models demonstrate moderate explanatory models (0.182 and 0.172, respectively), which align with findings in banking panel data studies. However, it is much lower for the P/E model (0.056), which emphasises the volatility of the model using an earnings-based metric. These values confirm that the models have a reasonable degree of explanatory power.

4.2.2 Individual ESG Pillars and Bank Value

When testing the importance of the individual ESG pillars, there is clear support for Hypothesis H3, which finds that there is significant heterogeneity between the pillars.

The panel regression for the E (Environmental) pillar is displayed in Table 4-4. The E score is statistically significant with a positive relationship with both the P/B ratio ($p=0.01$) and ROA ($p=0.092$). Even though the E Score marginally increases the ROA, these findings indicate that banks that perform highly environmentally experience greater valuations and improved asset efficiency. Pre-COVID, a 1-point increase in the E pillar increases P/B by 0.28%. Post-COVID, the marginal effect increases to 0.54% per point ($0.0028+0.0026$). The positive relationship between the E score and firm value aligns with the findings of Miralles-Quirós et al. (2019) in their studies.

However, the lagged E score had a highly significant and negative relationship with the P/B ratio ($p=0.000$) at a 0.01 significance level, and a significant and negative relationship with the P/E ratio ($p=0.016$) at a 0.05 significance level. This suggests that the initial benefit of scoring highly environmentally erodes over time. The interaction term has a positive and significant relationship with the P/B ratio at a 0.05 significance level ($p=0.013$), indicating banks had an increased value after COVID-19 when they scored higher in their E score. The result supports the hypothesis H4 for the environmental pillar, which strengthens after COVID. This is consistent with Díaz et al. (2021), who found that the environmental pillar is a key driver of outperforming other firms during COVID-19.

Table 4-4 Panel regression results for the environmental score with robust standard errors

Variable	P/B	P/E	ROA
E Score	0.0028** (0.001)	-0.0195 (0.074)	0.0000* (0.000)
Lagged E Score	-0.0032*** (0.001)	-0.0872** (0.035)	-0.0000 (0.000)
Post-COVID	-0.4284*** (0.097)	-6.4661 (4.287)	-0.0052* (0.003)
E Score × Post-COVID	0.0026** (0.001)	0.0542 (0.045)	0.0000 (0.000)
Bank Size	0.0246 (0.090)	-0.0526 (2.311)	0.0003 (0.002)
Leverage	0.1060 (0.627)	-20.3874 (21.383)	0.0176* (0.009)
NPL Ratio	-0.0075*** (0.002)	0.3506 (0.226)	-0.0003*** (0.000)
Loan-to-Deposit	-0.3465* (0.207)	-11.5501* (6.741)	-0.0113** (0.005)
Cost-to-Income	0.0002 (0.000)	0.0433* (0.026)	0.0000*** (0.000)

Capital Adequacy	0.0124 (0.008)	0.2810 (0.226)	0.0006*** (0.000)
Constant	0.9365 (1.103)	36.1826 (29.826)	0.0011* (0.024)
Observations	568	568	568
R-squared (Within)	0.198	0.057	0.176

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

Table 4-5 Panel regression results for the social score with robust standard errors

Variable	P/B	P/E	ROA
S Score	0.0010 (0.002)	0.1371 (0.115)	-0.0000 (0.000)
Lagged S Score	-0.0018 (0.002)	-0.1205 (0.114)	0.0000 (0.000)
Post-COVID	-0.2929* (0.170)	-0.5976 (4.629)	-0.0051** (0.002)
S Score × Post-COVID	0.0013 (0.002)	-0.0060 (0.056)	0.0000 (0.000)
Bank Size	-0.0397 (0.086)	-2.3780 (2.361)	-0.0004 (0.002)
Leverage	0.2234 (0.672)	-13.0984 (22.633)	0.0170* (0.009)
NPL Ratio	-0.0076*** (0.003)	0.3493 (0.226)	-0.0003*** (0.000)
Loan-to-Deposit	-0.3520* (0.210)	-12.6182 (8.112)	-0.0111** (0.004)
Cost-to-Income	0.0001 (0.000)	0.0420 (0.027)	0.0000*** (0.000)
Capital Adequacy	0.0101 (0.008)	0.2344 (0.218)	0.0006*** (0.000)

Constant	1.8081* (1.035)	50.1945 (31.731)	0.0135 (0.021)
Observations	568	568	568
R-squared		0.057	0.165
(Within)	0.177		

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

In Table 4-5, the results of the panel regression for the social pillar score are displayed. In contrast, there is no significant relationship between the social score and the valuation metrics. Moreover, there is no relationship with the lagged social pillar score. Alongside the S score and lagged S score, there is no significant relationship with the interaction term, suggesting that social performance does not influence the value or operational efficiency of banks within the time period of the study. The lack of significance between the interaction terms and the valuation metrics does not support the hypothesis H4 in the context of the social pillar.

This may be due to the benefits of companies improving their social performance, taking a longer period to influence the banks. Alternatively, banks may prioritise other factors such as environmental and governance improvements over social, with the lowered strictness of regulations for social over the other two. These findings about the importance of the social pillar in banking create an opportunity for further investigation into the effects of the pillar.

The G (governance) score exhibited similar results, as seen in Table 4-6, to the social score. While the G score and the lagged G score displayed no significant relationship with the P/B ratio, P/E ratio and the ROA, the interaction term resulted in a positive and significant relationship with ROA at the 0.05 significance

level ($p=0.047$). These results indicate that banks with higher G scores after COVID achieved a slightly better efficiency in assets and support Hypothesis H4 for the governance pillar.

The results in Table 4-6 emphasise the strong role governance plays for banks in periods of crisis. Banks with strong governance were most likely better enabled to adapt more effectively to the operational and economic challenges from the pandemic. The non-significant relationship between this interaction term and the P/B and P/E ratios suggests that the benefits of strong governance benefit operational efficiency more than immediately improving the market perceptions of the banks.

Table 4-6 Panel regression results for the governance score with robust standard errors

Variable	P/B	P/E	ROA
G Score	-0.0008 (0.001)	-0.0342 (0.032)	-0.0000 (0.000)
Lagged G Score	0.0009 (0.001)	-0.0255 (0.050)	-0.0000 (0.000)
Post-COVID	-0.3320*** (0.098)	1.7459 (2.085)	-0.0046*** (0.002)
G Score × Post-COVID	0.0020 (0.001)	-0.0418 (0.028)	0.0000** (0.000)
Bank Size	-0.0385 (0.080)	-2.2120 (2.449)	0.0001 (0.002)
Leverage	0.1088 (0.661)	-12.0981 (20.758)	0.0170* (0.010)
NPL Ratio	-0.0071*** (0.002)	0.3383 (0.235)	-0.0003*** (0.000)
Loan-to-Deposit	-0.3046 (0.206)	-13.8756* (7.256)	-0.0110** (0.004)

Cost-to-Income	0.0001 (0.000)	0.0406 (0.026)	0.0000*** (0.000)
Capital Adequacy	0.0095 (0.008)	0.2711 (0.218)	0.0006*** (0.000)
Constant	1.7145* (0.962)	54.1557 (32.770)	0.0068 (0.021)
Observations	568	568	568
R-squared (Within)	0.182	0.056	0.172

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

The results from the panel regressions of all the individual pillar scores in Table 4-4Table 4-5, Table 4-6 show the same results for the control variables, reinforcing their relevance in explaining bank valuation. The NPL ratio negatively and significantly (at the 0.01 significance level) impacts the P/B ratio and ROA, confirming its role as a strong indicator for credit risk. The greater the NPL ratio, the worse the market value and profitability of banks, most likely due to the increased risk perception. Alongside this, the loan-to-deposit ratio negatively affects the P/B ratio in Table 4-4Table 4-5, and the ROA in all three panel regressions for the pillars. This suggests that banks that perform aggressive lending compared to their deposits may signal to investors liquidity or credit risks that may damage their financial health

The cost-to-income ratio and capital adequacy are significant predictors of ROA, at the 0.01 significance level, in all three panel regressions. This highlights the role of the two control variables in the efficiency of operations and financial stability in driving asset returns. The explanatory power of the models is consistent with the main analysis; the individual pillar regressions demonstrate moderate explanatory power for the P/B ratio and ROA models. The R-squared

for the more volatile P/E models remains lower, which is common in corporate finance literature.

4.3 Additional Analysis

4.3.1 Non-linear ESG Effects

Prior literature, such as Azmi et al. (2021), has explored the non-linear relationship between ESG performance and bank value. This was done through the inclusion of a squared term of the ESG score in the regression. A U-shaped relationship between ESG and valuation implies that low levels of ESG investment could be perceived as costly or inefficient, but beyond a certain point, it would start to positively affect firm value.

The results for the panel regression, including the squared ESG score, are found in Table A-1. There was a statistically significant and positive relationship with the squared ESG score ($p=0.039$), with the standard ESG score possessing a statistically significant but negative relationship with P/B ($p=0.033$). This supports a U-shaped relationship, where moderate ESG scores penalise valuation, while high ESG scores will eventually enhance their value.

However, the evidence was not strong enough to suggest a non-linear link with operational performance and P/E ratio, with the ESG and squared term not statistically significant for both. The non-significant relationship with P/E indicates that market-based earnings expectations are not shaped by a non-linear ESG relationship in this sample.

The results suggest the benefits banks receive from ESG investments may only come into fruition at high levels of ESG performance, more particularly for asset-based metrics such as the P/B ratio. The findings with the P/B ratio complement

the findings on the ESGxPost-COVID interaction term in Table 4-4, reinforcing the idea that ESG may be undervalued initially, then is more valued in times of crisis or heightened risk.

4.3.2 ESG Effects by Bank Size

To test further whether the scale of the bank affects the relationship between ESG performance and bank value, the sample was split into two groups. The first group is small banks, which contain banks whose bank size (log of total assets) is smaller than or equal to the median (13.225), and the second group contains large banks with bank size greater than the median. Fixed effects regression was run separately for small banks, in Table A-2, and for large banks in Table A-3.

For small banks, the interaction term is positively associated with both the P/B ratio ($p=0.056$) and the ROA ($p=0.051$) at a 0.1 significance level, suggesting that ESG performance was valued more by the market, translating into operating performance, during and after COVID-19. These results are aligned with the view from Bolibok (2024), which states that smaller institutions, up to a certain size, can benefit more from ESG-related reputational advantages during a crisis due to fewer alternative signals that a larger bank would have. The post-COVID dummy variable is negatively and statistically significant for the P/B ratio ($p=0.004$) and ROA ($p=0.014$). The results from the dummy variable reinforce the increased risk exposure that smaller banks face in the pandemic period. However, for all the dependent variables, the ESG score and its lagged version were not significant.

The larger banks resulted in different values, with the ESG variables not being statistically significant across any of the dependent variables. This suggests that large banks that are involved in ESG efforts may have already been priced in by investors, or large banks have more diversified operations that reduce the impact

of ESG on the performance of banks. The dependent variables of large banks were also not significantly influenced by the interaction term, which suggests that ESG was not an effective resilience mechanism in the same way it was for smaller banks.

The overall analysis suggests that the relevance of the ESG value is not the same across the banking sector and has a greater relationship in smaller institutions during times of crisis, such as COVID-19. These findings indicate that ESG disclosure and scores may provide greater signalling power in smaller banks, and ESG initiatives serve as a differentiator for these banks, especially in times of uncertainty. The subsample indicates heterogeneity in the ESG-valuation relationship, suggesting that the value of ESG performance as a mechanism for resilience depends on the size of the bank.

4.3.3 Analysing the Pre- vs. Post-periods Beyond COVID

In order to investigate whether the relationship has changed between ESG performance and bank valuation following the COVID-19 pandemic, the dataset was split into two sections. The first section was the pre-COVID period, which covers 2015-2019, and the post-COVID period, covering 2020-2023. The fixed effect regressions use the same baseline model specification, which excludes the post-COVID dummy variable and the interaction term. This approach allows for the comparison of the ESG effects across the two periods without the interaction terms influencing the values.

The results from the pre-COVID period, found in Table A-4, show that ESG performance is not statistically significant to any of the three dependent variables. However, the lagged ESG score was significantly negative for the P/B ratio at a 0.01 significance level, and weakly statistically significant with the P/E ratio at a 0.1 significance level. The negative direction of the lagged ESG scores for the

two-valuation metrics suggests that ESG investments may have been perceived by the market as costly. This aligns with previous literature that found that initial ESG integration may be associated with costs that delay the benefits seen in the market (Fatemi et al., 2018). The P/B ratio model contains more significant predictors, including the NPL ratio, cost-to-income ratio, and capital adequacy.

In the post-COVID period, the ESG score and lagged ESG scores had positive coefficients across all the models, except for the ESG score in the P/E ratio model (found in Table A-5). Despite the positive coefficients, none of them are statistically significant. However, the directional change does indicate a change in market sentiment where ESG is viewed more favourably for contributing to long-term resilience and reputational strength. The control variables have become more influential during the post-COVID period, including the loan-to-deposit ratio, cost-to-income ratio and the capital adequacy. The results comply with the idea that the valuation, post-crisis, becomes increasingly influenced by robust fundamentals and efficiency.

Even though the results demonstrate that the effect of ESG on the valuation and performance of banks is modest, the comparison between the two periods suggests an increase in the relevance of the ESG score following the pandemic. The change in the coefficient signs of the ESG scores also supports the idea that the ESG scores increased the importance in the banking sector after the crisis. However, the predictor is still statistically insignificant in the post-COVID sample, so the results should be interpreted with caution.

4.4 Robustness Tests

Initially, the Hausman test produced a negative test statistic, which is due to the violations that arise from the asymptotic assumptions. This occurs with panel data

when the variance-matrix is not positive, so the Sigmamore option was used, which allows the estimators to be compared better.

To determine whether the fixed effects model is preferred in the panel regression over random effects, the Hausman specification tests (with the Stata Sigmamore option) were conducted across all three of the dependent variables of the original model. The P/B model produced a chi-square value of 24.41 ($p=0.0037$), rejecting the null hypothesis and confirming that the fixed effects model is preferred. However, the P/E model failed to reject the null at a 0.05 significance level with a chi-square value of 15.24 ($p=0.0845$). But it did show marginal significance at a 0.1 significance level, suggesting slight evidence for fixed effects. Since this is consistent with theory, which states that bank-specific ESG strategies may correlate with valuation metrics, the fixed effects model remains. It also aligns with the theoretical expectations of correlation between bank-specific effects and regressors; FE was preferred. The final test with the ROA resulted in a chi-square value of 31.83 ($p=0.0002$), which strongly rejects the random effects model. Using the Sigmamore option and additional diagnostic checks confirms no multicollinearity or scaling problems. The fixed effects specification remains both theoretically and statistically justified across all models, especially when firm-specific time-invariant characteristics are expected to correlate with regressions in the model (Wooldridge, 2010).

To test for multicollinearity, the variance inflation factor (VIF) was used across the three models. The average VIF for all three models was 12.66, which is greater than the normal threshold of 10. However, the value has been inflated from two predictors, the first being the post-COVID dummy variable, and the second being the interaction term. The dummy variable had a VIF of 52.41, and the interaction term had a VIF of 54.27, which are collinear due to the creation of the interaction. The VIF values of the other variables remained below 7, suggesting the models contained no severe multicollinearity issues among the core predictors. Since the other variables contained no signs of multicollinearity and the theoretical

justification of the interaction term and dummy variable, multicollinearity is not considered a significant issue in this analysis.

Another test to confirm the panel data approach was correct was the Breusch-Pagan Lagrangian Multiplier test for random effects. The test evaluates whether the variance across the banks is significantly different from zero. The test for the P/B ratio and the ROA model showed that the test strongly rejected the null hypothesis of no panel effect ($p=0.0000$ for both), which indicates unobserved heterogeneity across banks, justifying a panel structure. The test for the P/E model displayed no significance at a 0.05 level ($p=0.0962$), but was significant at a 0.1 level. The combination of results with the Breusch-Pagan Lagrangian Multiplier test and the Hausman test favours the fixed effects model over a random effect. The findings support the use of fixed effects and clustered standard errors for robustness across all the dependent variables.

To test the misspecification of the model, the Ramsey RESET test is usually used. However, this requires the model to be a traditional OLS, but since the model is a FE with clustered standard errors, a manual approach is used. The approach requires generating squared fitted values ($\hat{y}^2$) and including them directly in the original panel regressions. For the P/B ratio and the ROA, the squared predicted terms were statistically insignificant ($p=0.414$ and $p=0.228$), which indicates there is no evidence of misspecification. However, the squared predicted term in the P/E model ($p=0.002$) was statistically significant, suggesting possible misspecification. Despite the possible misspecification, this may be due to the volatility and the noise of the P/E ratio in banking, which is known to be sensitive to low earnings. If there is non-linearity in the relationship between ESG scores and the dependent variables, it was addressed in the earlier section with the inclusion of the squared ESG score, which only confirmed the U-shaped relationship for the P/B ratio.

For the original model, to determine the joint impact of ESG performance in the post-COVID period, a Wald test was used to test the linear restriction between the ESG score coefficient and the coefficient of the interaction term. The P/B ratio was not statistically significant ($p=0.154$), and neither was the ROA ($p=0.104$). The P/E ratio yielded a p-value of 0.647, suggesting there is no joint effect in this context. These results provide slight evidence that the ESG factors may have become more relevant in influencing the performance in the market and accountancy post-COVID. Prior findings of volatility and weak explanatory power in multiples containing earnings may explain the lack of significance in the P/E model. The results align with the earlier tests, which support the conclusion of the modest effect of ESG performance in the post-crisis valuation of banks.

5 Discussion

5.1 Interpretation of Key Findings

This study examined the role of ESG performance in the valuation of banks, with an emphasis on how the relationship changed after COVID-19. The main study's findings, found in Table 4-3, demonstrated the significance of the interaction term in influencing the P/B and ROA. The interaction is positively and statistically significant, which aligns with Hypothesis H2, providing evidence that the ESG score has an improved positive effect on bank valuation after COVID-19.

However, the support for Hypothesis H1 is not provided. In the main study, the effect of the ESG predictor was statistically insignificant across all three models. The weakened support of the Hypothesis H1 indicates that ESG performance does not have a strong influence on the valuation of banks before the unstable COVID period. The impact of ESG appears to provide influence in periods of crisis, supporting the idea that ESG is a signal for resilience during periods of stress. The repricing, post-COVID, is consistent with Signalling Theory, where higher ESG performance signals lower risk and better management quality to investors, who reward these qualities Spence (1973). The pricing of ESG information when it is relevant to risk also fits the semi-strong EMH.

The dummy variables, representing post-COVID, saw a 1-point ESG improvement corresponding to a 0.37% in P/B and 0.01% in ROA. Through this, investors can expect lifts in valuation and profitability when improvements are credible and assured externally, especially for smaller banks and when driven by E and G scores. The significance of the interaction term also suggests that firms that performed better in their ESG scores experienced a mitigation in their decline in valuation and performance, providing evidence of the buffering effects of the ESG score.

There was a consistent lack of significance between the P/E ratio and the ESG scores or their interaction terms. The weak relationship reflects the nature of earnings and the volatility banks experience during crises, suggesting that participants in the market rely less on the P/E ratio for assessing the resilience of ESG than on P/B or ROA.

Analysing the individual effects of the pillars of the ESG score provided further insights and aligned with Hypothesis H3. The results of the E score indicated that the market appreciates banks' environmental initiatives, due to the positive and significant association with P/B and ROA. However, the lagged E score negatively impacted the P/B and P/E ratios, which may suggest the benefits of these initiatives may erode or the market may underreact to the initial news of these investments. However, the interaction term displayed the opposite impact, with a positive and significant influence for P/B, which demonstrates the strength of having a strong environmental score during times of crises and aligns with Hypothesis H4.

On the other hand, the social score possessed no significant relationships with the actual score or the interaction variable. This may be due to the difficulty in measuring social efforts or the speed of the positive effects, suggesting market participants view these initiatives less than the environmental pillar.

The governance score interaction variable (GxPost-COVID) effect on ROA is statistically positive but economically small, aligning with Hypothesis H4, in the ROA model, displaying the positive benefit of banks having robust governance for operational resilience. The importance of regulatory compliance, risk management, and navigation in crisis makes governance critical for banking.

To test whether the ESG score had a U-shaped relationship with the valuation metric, an introduction of a squared ESG term was introduced. The results showed a significant relationship with P/B, suggesting that moderate ESG scores may be viewed as costly, but once past a threshold, the stronger ESG score strengthens a bank's market valuation.

When dividing the sample by bank size, the results revealed heterogeneity. Smaller banks possessed a significant and positive interaction term for the P/B ratio and the ROA. The indication of the results is that smaller banks felt a greater advantage from ESG performance, possibly because of their lower capacity for resilience. Larger banks showed no effect from the ESG score, potentially because the market had already priced in the ESG signals.

When splitting the sample into different periods to determine the post-COVID effect on the ESG score, the ESG effect in the post-COVID sample was insignificant. The result appears to contradict the baseline model, but it reinforces the importance of the interaction term and how it captures the relevance of ESG during the crisis, rather than ESG having an unconditional effect post-COVID. Due to the split in the sample, the reduced number of observations suggests that the two samples may also contain increased noise, leading to reduced significance.

5.2 How the Existing Literature Compares with the Results

The study's findings align with a growing body of literature identifying ESG as an indicator of resilience during crisis. The results confirm that firms with stronger ESG profiles perform better during COVID-19 (Albuquerque et al., 2020; Broadstock et al., 2021) and that ESG acts as a risk-mitigating factor (Fatemi et al., 2018). These results contribute to the underexplored banking sector by demonstrating the specific effect.

The results from the control variables, especially the consistent significance of capital adequacy and the NPL ratio, have been observed in existing literature. The consistent significance of the control variables, such as the NPL ratio and capital adequacy (Tier 1 Ratio), aligns with previous literature such as Athanasoglou et al. (2008) and Menicucci and Paolucci (2022). The NPL ratio's negative relationship with the P/B ratio and ROA is consistent with how asset quality influences the performance of banks. The positive relationship of capital adequacy and the cost-to-income ratio with ROA also matches the expectations and supports the view from Berger and Bouwman (2013), who found that banks with large amounts of capital are more resilient and profitable, especially in times of stress.

Buallay (2019) discovered the positive responsibility of having a strong environmental performance, which supports this study's findings of the positive direct effect the E score has on valuation metrics. Likewise, with the interaction term of the governance score, aligning with the literature (Gerged et al., 2021), which highlights the importance of banks having strong governance during a crisis.

However, the study does present contributions that contradict previous findings. The insignificance of the ESG score before COVID-19 contradicts the previous ESG-firm value findings, suggesting that the ESG pricing is specific to sectors. Previous findings from literature, such as Friede et al. (2015), who found a large number of papers suggesting a direct positive ESG-firm value, are contradicted by this paper's results. The effect of the lagged E score being negative adds another variation, providing an implication that the market reaction to investments into environmental products may be delayed or vary in context, which has been noted by Fatemi et al. (2018), who found the effect is context-based. The constant

insignificant relationship of the social pillar emphasises the current difficulties of measuring the value of social efforts.

The insignificant effect of the ESG score on the P/E ratio corroborates previous worries about the sensitivity of the ratio to noise, especially in the banking sector. This does confirm how the P/B ratio and ROA are better suited as reliable indicators for the valuation effect of the ESG score.

The focus of the study is on the banks and the date of the sample being pre- and post-COVID, with the pandemic serving as a natural experiment for the relevance of valuation.

5.3 Result Implications to Theory

The findings support the Signalling Theory, with the significance of the ESG score interaction term reinforcing this idea. The strong ESG performance will signal to market participants about the lower long-term risk and stronger resilience in crisis periods. The U-shaped effect of the ESG score also provides more support to this theory, with a weak ESG signal potentially reducing credibility, while a stronger ESG performance provides a better signal to investors

Along with the Signalling Theory, the Stakeholder Theory is also validated. Banks that positively engage with their stakeholders through ESG practices will likely improve their reputations and operational flexibility, which translates into a higher valuation and ROA during a crisis. The environmental and governance pillar, being significant, further adds to the validation, highlighting how stakeholders' response to the environmental and governance pillars can produce value.

The insignificance of the ESG score, pre-COVID, reflects the inefficiency in the market or how the pricing of the ESG score is delayed, which does not comply with the strong-form EMH. The post-COVID interaction term supports the semi-strong EMH, where ESG scores only become material in crisis.

5.4 The Implications for the Banking Industry

The banking industry can use ESG not just for policy, but also as a resilience signal by making improvements in environmental and governance observable and comparable. In practice, this could mean setting portfolio targets, such as high-carbon exposure caps, increasing green lending, and reporting audited KPIs for each pillar at regular intervals. With governance, a few ways could be providing pay for executives that is linked to E and G KPIs and providing board members with transparent ESG and climate oversight.

Investors can use the ESG information and price it in, which is consistent with the post-COVID estimates. Verified progress in E and G scores will be reflected by investors, providing an increase to valuation and be cautious about unverified claims. Even regulators can use these results to enforce more consistent and comparable disclosure, and potentially include ESG indicators in their frameworks for stress-testing.

5.5 Limitations

While a few, the study still faces certain limitations. The first is the consistency of the ESG score, with different providers using different methodologies, which could provide issues with comparability. However, Refinitiv attempts to remove these issues by aggregating hundreds of distinct ESG metrics to enhance comparability. The second limitation is that the lagged ESG score only captures the effects over a short-term period, but the true impact of ESG may create value over a longer horizon.

The concern of endogeneity remains. Although the inclusion of the lagged terms and the fixed effect regression helps to mitigate reverse causality, the causal inference is not guaranteed. The cause-and-effect nature of COVID-19 provides a quasi-experimental setting, but the complexity introduces noise into the model.

The consistent insignificance in the P/E models reflects the limitation of the tool as a valuation metric in banking, particularly during a crisis. Alongside this, the sample only focuses on OECD banks may limit the generalisability to emerging markets.

While 2020 is considered by the WHO as the year breakout, the year may oversimplify the impact of COVID-19, which evolved over the following years. Similarly, controlling for the key variables may mean that the unobserved shocks from countries and firms may still affect the results.

However, despite the limitations, the study still offers a strong contribution to the context of ESG scores in the banking sector and over a crisis period, offering both a theoretical and practical value.

6 Conclusion

The study investigated the relationship between the valuation of banks, within OECD countries, and the Environmental, Social, and Governance (ESG) performance. The study aimed to understand the effect of COVID-19 on the relationship. The period saw increases in market stress and an increase in focus on sustainability and resilience globally. The sample included 71 banks ranging from 2015 to 2023, employing a fixed-effects panel regression model to provide a sector-specific contribution to an increasingly popular field of sustainable finance.

Table 6-1 Summary of Key Findings and Hypotheses

Hypothesis	Description	Outcome	Evidence
H1	ESG scores are positively associated with bank valuation	Not Supported	The coefficient of the ESG score is statistically insignificant in all baseline models pre-COVID
H2	The positive effect of ESG on bank valuation strengthens post-COVID	Supported	The interaction term is significantly positive for the P/B ratio and ROA
H3	Individual pillars have different impacts on bank valuation	Supported	The E and G pillars displayed significance, while the S pillar was consistently insignificant
H4	The relationship for individual pillars	Partially Supported	The effect of the E pillar (on P/B ratio) and the G pillar (on ROA)

	strengthens post-COVID		strengthened, but not for the S pillar
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The pre-COVID results, where market conditions were normal, displayed no statistically significant relationship between banks' overall ESG score and the valuation metrics (P/B, P/E, and ROA). This is in line with semi-strong EMH since the significance, pre-COVID, suggesting information was not immediately priced by investors in stable conditions, consistent with literature (Fama, 1970).

However, after 2020, the relationship between ESG and valuation strengthened, with the interaction term being positive and statistically significant for the P/B ratio and the ROA. The strengthened relationship is consistent with evidence during COVID, where firms with higher ESG performance delivered better returns and lower downside risk, supporting the idea that it signals greater resilience to investors (Albuquerque et al., 2020; Broadstock et al., 2021; Díaz et al., 2021)

The individual pillars differed in the relationship with the valuation metrics, with the Environmental (E) pillar positively related to bank valuation and marginally related to ROA. The Social (S) pillar was insignificant across all the models; thus, heterogeneity in the model demonstrates that the aggregation of the ESG score into a singular measure can mask how different sustainability dimensions are priced by the market.

Finally, the fourth hypothesis (H4) had partial support from the results. The demand for resilience from the markets during crisis periods was mostly driven by the environmental and governance score. A stronger E score was associated with stronger market valuation (P/B) in the post-COVID periods, while banks possessing stronger governance were linked with stronger operational performance (ROA). These results highlight the focus of the market on stronger

environmental resilience and solid governance during a crisis. The social (S) score was consistently insignificant, suggesting it was not valued before or after COVID.

The results from the further analysis revealed a non-linear relationship between ESG and the P/B ratio, with the resilience effect being more pronounced for smaller banks. This suggests the ESG-valuation relationship is non-linear and the payoff is dependent on size, consistent with evidence from prior literature (Azmi et al., 2021; Ersoy et al., 2022; Bolibok, 2024).

The results provide contributions to financial theories, with the first being the Signalling Theory. The results provided strong support to this theory since the increased ESG value, during a crisis, suggests it is a good signal of lower risk and stronger management quality, which is valuable when information asymmetry is high. The second, being the Stakeholder Theory, was also validated since the banks that effectively managed their environmental and governance responsibilities were rewarded with higher valuations and stronger operational performance. The Efficient Market Hypothesis (EMH) was challenged since the results suggested the markets underreacted to ESG information in periods of stability, and only priced the risk-mitigating values when a shock to the market occurred.

For banks, the findings determine that ESG, used to measure sustainability, is not just a compliance matter, but an imperative in strategy to build resilience. They also suggest long-term investments in environmental risk management and strong governance can provide strong returns in the form of improvements in valuation and operational stability in periods of crisis. Small banks, specifically, which possess a strong ESG profile, can possess a key differentiator and use it as a strong signal of quality to investors. The results of the post-COVID period indicate OECD banks can use ESG performance as a priced resilience signal,

especially when progress in environmental and governance is observable and comparable.

The study motivates regulators and policymakers to encourage the disclosure of ESG within the banking sector. The link between strong ESG performance and resilience during crisis periods suggests that the metrics can provide valuable inputs for risk assessments and systemic stress-testing frameworks. Consistent and mandatory standards in the disclosure of ESG can improve the efficiency in the market and allow stakeholders to better assess the long-term viability of financial institutions.

Despite the contributions this study provides, limitations remain. The first is the inconsistency in ESG data across different providers. While Refinitiv was chosen for its vast and detailed methodology, there still remains a universally accepted standard to represent ESG, which can affect the comparability of results across studies. The second is the potential of endogeneity; despite the use of lagged variables and a fixed-effects model, it cannot be eliminated. The causal relationship between valuation metrics and ESG is complex and could be subject to unobserved variables. The third is the limited scope of the sample. Using 71 OECD banks does improve comparability, but does limit the generalisability of the findings to privately listed banks and emerging markets, where ESG may be viewed differently. The final limitation is the time horizon of the study, since the post-COVID period is relatively short. The long-term impact of ESG initiatives after the crisis may only become apparent longer into the future.

For future research, there are a few avenues to investigate to fill the gaps in the limitations. Future studies could extend the period of the sample to analyse the relationship between ESG and valuation over a longer period after the pandemic to ensure the resilience premium persists in the long run or reduces as the market becomes less volatile. Secondly, increasing the diversity of the sample by

incorporating private banks and banks from emerging markets would improve generalisability. This would enable comparisons and interaction tests across multiple contexts to identify where the individual pillars matter most. The third avenue is to adopt a mixed-methods design, which would combine a fixed-effect panel regression with interviews from ESG stakeholders and analysis of sustainability reports to explain relationship patterns and the U-shape. To account for external influences and address endogeneity concerns, another avenue could include employing dynamic panel models, such as the Generalised Method of Moments (GMM), country and year fixed effects, and macro and policy controls, to provide more robust causal estimates.

References

- Albuquerque, R., Koskinen, Y., Yang, S., & Zhang, C. (2020). Resiliency of Environmental and Social Stocks: An Analysis of the Exogenous COVID-19 Market Crash. *The Review of Corporate Finance Studies*, 9(3), 593–621.
<https://doi.org/10.1093/rcfs/cfaa011>
- Aras, G., & Hacioglu Kazak, E. (2022). Enhancing Firm Value through the Lens of ESG Materiality: Evidence from the Banking Sector in OECD Countries. *Sustainability*, 14(22), 15302. <https://doi.org/10.3390/su142215302>
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18(2), 121–136.
- Aydogmus, M., Gulay, G., & Ergun, K. (2022). Impact of ESG Performance on Firm Value and Profitability. *Borsa Istanbul Review*, 22(2), 119–127.
<https://doi.org/10.1016/j.bir.2022.11.006>
- Azmi, W., Hassan, M. K., Houston, R., & Karim, M. S. (2021). ESG activities and banking performance: International evidence from emerging economies. *Journal of International Financial Markets, Institutions and Money*, 70.
<https://doi.org/10.1016/j.intfin.2020.101277>
- Barth, J. R., Caprio, G., & Levine, R. (2004). Bank regulation and supervision: what works best? *Journal of Financial Intermediation*, 13(2), 205–248.
<https://doi.org/10.1016/j.jfi.2003.06.002>

Beloskar, V. D., & Rao, S. V. D. N. (2023). Did ESG Save the Day? Evidence From India During the COVID-19 Crisis. *Asia-Pacific Financial Markets*, 30, 73–107. <https://doi.org/10.1007/s10690-022-09369-5>

Berger, A. N., & Bouwman, C. H. S. (2013). How does capital affect bank performance during financial crises? *Journal of Financial Economics*, 109(1), 146–176. <https://doi.org/10.1016/j.jfineco.2013.02.008>

Berger, A. N., & Mester, L. J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions? *Journal of Banking & Finance*, 21(7), 895–947. [https://doi.org/10.1016/s0378-4266\(97\)00010-1](https://doi.org/10.1016/s0378-4266(97)00010-1)

Bolibok, P. M. (2024). Does Firm Size Matter for ESG Risk? Cross-Sectional Evidence from the Banking Industry. *Sustainability*, 16(2), 679–679. <https://doi.org/10.3390/su16020679>

Bonacorsi, L., Cerasi, V., Galfrascoli, P., & Manera, M. (2024). ESG Factors and Firms' Credit Risk. *Journal of Climate Finance*, 6, 100032. <https://doi.org/10.1016/j.jclimf.2024.100032>

Bressan, S., & Weissensteiner, A. (2024). Stock Returns and ESG Scores of Banks. *Ssrn.com*. <https://ssrn.com/abstract=4906672>

Broadstock, D. C., Chan, K., Cheng, L. T. W., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. *Finance Research Letters*, 38(38), 101716. <https://doi.org/10.1016/j.frl.2020.101716>

Buallay, A. (2019). Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality: An International Journal*, 30(1), 98–115.

Damodaran, A. (2012). *Investment valuation: Tools and techniques for determining the value of any asset* (3rd ed.). John Wiley & Sons.

Demir, E., & Danisman, G. O. (2021). Banking sector reactions to COVID-19: The role of bank-specific factors and government policy responses. *Research in International Business and Finance*, 58, 101508.
<https://doi.org/10.1016/j.ribaf.2021.101508>

Di Tommaso, C., & Thornton, J. (2020). Do ESG scores effect bank risk taking and value? Evidence from European banks. *Corporate Social Responsibility and Environmental Management*, 27(5), 2286–2298.
<https://doi.org/10.1002/csr.1964>

Díaz, V., Ibrushi, D., & Zhao, J. (2021). Reconsidering systematic factors during the Covid-19 pandemic – The rising importance of ESG. *Finance Research Letters*, 38, 101870. <https://doi.org/10.1016/j.frl.2020.101870>

Engelhardt, N., Ekkenga, J., & Posch, P. (2021). ESG Ratings and Stock Performance during the COVID-19 Crisis. *Sustainability*, 13(13), 7133.
<https://doi.org/10.3390/su13137133>

Ersoy, E., Swiecka, B., Grima, S., Özen, E., & Romanova, I. (2022). The Impact of ESG Scores on Bank Market Value? Evidence from the U.S. Banking Industry. *Sustainability*, 14(15), 9527. <https://doi.org/10.3390/su14159527>

Fama, E. F. (1970). Efficient capital markets . *Journal of Finance*, 25(2), 383–417.

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), 427–465.
<https://doi.org/10.1111/j.1540-6261.1992.tb04398.x>

Fatemi, A., Glaum, M., & Kaiser, S. (2018). ESG performance and firm value: The moderating role of disclosure. *Global Finance Journal*, 38(1044-0283), 45–64. <https://doi.org/10.1016/j.gfj.2017.03.001>

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Pitman.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and Financial performance: Aggregated Evidence from More than 2000 Empirical Studies. *Journal of Sustainable Finance & Investment*, 5(4), 210–233.
<https://doi.org/10.1080/20430795.2015.1118917>

Friedman, M. (1970). The Social Responsibility of Business Is to Increase Its Profits. In *Corporate Ethics and Corporate Governance* (pp. 173–178). The New York Times Magazine. https://doi.org/10.1007/978-3-540-70818-6_14

Galletta, S., Mazzù, S., & Naciti, V. (2022). A bibliometric analysis of ESG performance in the banking industry: From the current status to future directions. *Research in International Business and Finance*, 62, 101684. <https://doi.org/10.1016/j.ribaf.2022.101684>

Gangi, F., Meles, A., D'Angelo, E., & Daniele, L. M. (2018). Sustainable development and corporate governance in the financial system: Are environmentally friendly banks less risky? *Corporate Social Responsibility and Environmental Management*, 26(3), 529–547. <https://doi.org/10.1002/csr.1699>

Gao, M., & Geng, X. (2024). The role of ESG performance during times of COVID-19 pandemic. *Scientific Reports*, 14(1). <https://doi.org/10.1038/s41598-024-52245-7>

Giese, G., Lee, L.-E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). Foundations of ESG Investing: How ESG Affects Equity Valuation, Risk, and Performance. *The Journal of Portfolio Management*, 45(5), 69–83. <https://doi.org/10.3905/jpm.2019.45.5.069>

Gottwald, R. (2012). The Use of the P/E Ratio to Stock Valuation. *European Grants Projects Journals*, 1(2), 21–24.

Hess, K., & Francis, G. (2004). Cost income ratio benchmarking in banking: a case study. *Benchmarking: An International Journal*, 11(3), 303–319. <https://doi.org/10.1108/14635770410538772>

Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management, and social issues: what's the bottom line? *Strategic Management Journal*, 22(2), 125–139. [https://doi.org/10.1002/1097-0266\(200101\)22:2%3C125::AID-SMJ150%3E3.0.CO;2-H](https://doi.org/10.1002/1097-0266(200101)22:2%3C125::AID-SMJ150%3E3.0.CO;2-H)

Istaiteyeh, R., Milhem, M. M., Najem, F., & Elsayed, A. (2024). Determinants of Operating Efficiency for the Jordanian Banks: A Panel Data Econometric Approach. *International Journal of Financial Studies*, 12(1), 12–12. <https://doi.org/10.3390/ijfs12010012>

Jang, G.-Y., Kang, H.-G., Lee, J.-Y., & Bae, K. (2020). ESG Scores and the Credit Market. *Sustainability*, 12(8), 3456. <https://doi.org/10.3390/su12083456>

Jonsdottir, B., Sigurjonsson, T. O., Johannsdottir, L., & Wendt, S. (2022). Barriers to Using ESG Data for Investment Decisions. *Sustainability*, 14(9), 5157. <https://doi.org/10.3390/su14095157>

Kim, Y., Li, H., & Li, S. (2014). Corporate social responsibility and stock price crash risk. *Journal of Banking & Finance*, 43, 1–13.

Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics*, 115(2), 304–329.

Kulova, I., & Nikolova-Alexieva, V. (2023). ESG strategy: pivotal in cultivating stakeholder trust and ensuring customer loyalty. *E3S Web of Conferences*, 462, 03035. <https://doi.org/10.1051/e3sconf/202346203035>

Liu, S., Jin, J., & Nainar, K. (2023). Does ESG Performance Reduce Banks' Nonperforming Loans? *Finance Research Letters*, 55, 103859.

<https://doi.org/10.1016/j.frl.2023.103859>

Menicucci, E., & Paolucci, G. (2022). ESG dimensions and bank performance: An empirical investigation in Italy. *Corporate Governance: The International Journal of Business in Society*, 23(3), 563–586. <https://doi.org/10.1108/cg-03-2022-0094>

Minor, D., & Morgan, J. (2011). CSR as Reputation Insurance: Primum Non Nocere. *California Management Review*, 53(3), 40–59.

<https://doi.org/10.1525/cmr.2011.53.3.40>

Miralles-Quirós, M., Miralles-Quirós, J., & Redondo Hernández, J. (2019). ESG Performance and Shareholder Value Creation in the Banking Industry: International Differences. *Sustainability*, 11(5), 1404.

<https://doi.org/10.3390/su11051404>

Miranda, B., Delgado, C., & Branco, M. C. (2023). Board Characteristics, Social Trust and ESG Performance in the European Banking Sector. *Journal of Risk and Financial Management*, 16(4), 244–244.

<https://doi.org/10.3390/jrfm16040244>

Pucci, N. (2025). Europe Continues to Dominate the Sustainable Fund Market. *Morningstar UK*. [https://www.morningstar.co.uk/uk/news/260061/europe-](https://www.morningstar.co.uk/uk/news/260061/europe-continues-to-dominate-the-sustainable-fund-market.aspx)

[continues-to-dominate-the-sustainable-fund-market.aspx](https://www.morningstar.co.uk/uk/news/260061/europe-continues-to-dominate-the-sustainable-fund-market.aspx)

Quintiliani, A. (2022). ESG and Firm Value. *Accounting and Finance Research*, 11(4), 37. <https://doi.org/10.5430/afr.v11n4p37>

Rahat, B., & Nguyen, P. (2024). The impact of ESG profile on Firm's valuation in emerging markets. *International Review of Financial Analysis*, 95, 103361. <https://doi.org/10.1016/j.irfa.2024.103361>

Rastogi, S., & Singh, K. (2022). The impact of ESG on the bank valuation: evidence of moderation by ICT. *Journal of Global Responsibility*, 14(2). <https://doi.org/10.1108/jgr-07-2022-0075>

Reising, J. (2023). Impact of ESG on Bank Performance and Risk Around the COVID-19 Pandemic. *Journal of Finance Issues*, 21(1), 48–65. <https://doi.org/10.58886/jfi.v21i1.5217>

Savio, R., D'Andrassi, E., & Ventimiglia, F. (2023). A Systematic Literature Review on ESG during the COVID-19 Pandemic. *Sustainability*, 15(3), 2020. <https://doi.org/10.3390/su15032020>

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

Sun, Y., Zhao, D., & Cao, Y. (2024). The Impact of ESG performance, Reporting framework, and Reporting Assurance on the Tone of ESG disclosures: Evidence from Chinese Listed Firms. *Journal of Cleaner Production*, 466, 142698–142698. <https://doi.org/10.1016/j.jclepro.2024.142698>

Walter, I. (2016). Reputational risks and large international banks. *Financial Markets and Portfolio Management*, 30(1), 1–17.

<https://doi.org/10.1007/s11408-016-0264-x>

Weber, O., Mansfeld, M., & Schirrmann, E. (2012). The Financial Performance of RI Funds After 2000. *Issues in Business Ethics*, 31, 75–91.

https://doi.org/10.1007/978-90-481-9319-6_5

Wong, W. C., Batten, J. A., Ahmad, A. H., Mohamed-Arshad, S. B., Nordin, S., & Adzis, A. A. (2020). Does ESG certification add firm value? *Finance Research Letters*, 39(101593), 101593. <https://doi.org/10.1016/j.frl.2020.101593>

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*, second edition. In *Google Books*. MIT Press.

<https://books.google.co.uk/books?hl=en&lr=&id=hSs3AgAAQBAJ&oi=fnd&pg=PP1&dq=Wooldridge>

World Health Organization. (2020). *Archived: WHO timeline - COVID-19*. World Health Organization. <https://www.who.int/news/item/27-04-2020-who-timeline---covid-19>

Yadav, M., Dhingra, B., Batra, S., Saini, M., & Aggarwal, V. (2024). ESG scores and stock returns during COVID-19: an empirical analysis of an emerging market. *International Journal of Social Economics*, 52(3).

<https://doi.org/10.1108/ijse-10-2023-0819>

Yuen, M. K., Ngo, T., Le, T. D. Q., & Ho, T. H. (2022). The environment, social and governance (ESG) activities and profitability under COVID-19: evidence from the global banking sector. *Journal of Economics and Development*, 24(4), 345–364. <https://doi.org/10.1108/jed-08-2022-0136>

Appendices

Appendix A List of Appendix Tables

Table A-1 Panel regression results for the ESG score, including the squared ESG value, with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	-0.0201** (0.009)	0.1305 (0.205)	0.0001 (0.000)
Lagged ESG Score	-0.0002 (0.002)	-0.1257 (0.126)	-0.0000 (0.000)
(ESG Score) ²	0.0001** (0.000)	-0.0006 (0.002)	-0.0000 (0.000)
Post-COVID	-0.3653** (0.176)	2.2377 (4.150)	-0.0082*** (0.003)
ESG × Post-COVID	0.0022 (0.002)	-0.0436 (0.054)	0.0001** (0.000)
Bank Size	-0.0026 (0.088)	-1.6797 (2.362)	0.0002 (0.002)
Leverage	0.0647 (0.670)	-12.9899 (21.156)	0.0163* (0.010)
NPL Ratio	-0.0073*** (0.003)	0.3300 (0.226)	-0.0002*** (0.000)
Loan-to-Deposit	-0.3263 (0.200)	-13.2891* (7.725)	-0.0110** (0.004)
Cost-to-Income	0.0002 (0.000)	0.0399 (0.026)	0.0000*** (0.000)
Capital Adequacy	0.0092 (0.008)	0.2960 (0.222)	0.0006*** (0.000)
Constant	1.9790* (1.045)	45.4543 (32.333)	0.0032 (0.025)

Variable	P/B Ratio	P/E Ratio	ROA
Observations	568	568	568
R-squared (Within)	0.191	0.056	0.172

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

Table A-2 Panel regression results for the ESG score, focusing on smaller banks, with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	-0.0024 (0.002)	0.0335 (0.149)	0.0000 (0.000)
Lagged ESG Score	-0.0000 (0.002)	-0.0701 (0.162)	-0.0000 (0.000)
Post-COVID	-0.6088*** (0.197)	1.3327 (5.306)	-0.0114** (0.004)
ESG × Post-COVID	0.0051* (0.003)	-0.0463 (0.074)	0.0001* (0.000)
Bank Size	-0.0790 (0.106)	0.2945 (3.899)	0.0019 (0.003)
Leverage	0.2302 (0.964)	-17.1976 (34.649)	0.0112 (0.018)
NPL Ratio	-0.0051* (0.003)	0.2716 (0.190)	-0.0002** (0.000)
Loan-to-Deposit	-0.5087* (0.252)	-13.1275 (9.843)	-0.0142** (0.007)
Cost-to-Income	-0.0021 (0.002)	0.2131 (0.186)	0.0001 (0.000)

Variable	P/B Ratio	P/E Ratio	ROA
Capital Adequacy	0.0238*** (0.009)	-0.0489 (0.322)	0.0007*** (0.000)
Constant	2.3293** (1.096)	25.4964 (46.497)	-0.0088 (0.028)
Observations	282	282	282
R-squared (Within)	0.253	0.094	0.220

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

Table A-3 Panel regression results for the ESG score, focusing on larger banks, with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	0.0058 (0.004)	0.1897 (0.174)	-0.0000 (0.000)
Lagged ESG Score	-0.0004 (0.003)	-0.1974 (0.181)	0.0000 (0.000)
Post-COVID	-0.1591 (0.345)	17.4448* (9.735)	-0.0013 (0.005)
ESG × Post-COVID	-0.0002 (0.004)	-0.2205 (0.122)	0.0000 (0.000)
Bank Size	0.1079 (0.187)	-5.3195 (3.474)	-0.0021 (0.005)
Leverage	0.2271 (0.818)	-24.5190 (23.511)	0.02011** (0.010)
NPL Ratio	-0.0206 (0.016)	0.1496 (0.1803)	-0.0003 (0.000)

Variable	P/B Ratio	P/E Ratio	ROA
Loan-to-Deposit	-0.1349 (0.371)	-10.9541 (8.551)	-0.0052 (0.004)
Cost-to-Income	0.0004* (0.000)	0.0139 (0.016)	0.0000*** (0.000)
Capital Adequacy	-0.0113 (0.013)	0.8143 (0.450)	0.0005 (0.000)
Constant	-0.5793 (2.543)	87.8922* (44.319)	0.02898 (0.059)
Observations	286	286	286
R-squared (Within)	0.169	0.059	0.105

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

Table A-4 Panel regression results for the ESG score, pre-COVID Regression (2015-2019), with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	-0.0010 (0.002)	0.1535 (0.168)	0.0000 (0.000)
Lagged ESG Score	-0.0060*** (0.002)	-0.2951* (0.164)	-0.0000 (0.000)
Bank Size	0.1876 (0.134)	-2.7581 (4.682)	0.0028 (0.004)
Leverage	-0.8773 (0.591)	-1.8116 (32.535)	0.0117 (0.013)
NPL Ratio	0.0057* (0.003)	0.2020 (0.263)	-0.0001 (0.000)

Variable	P/B Ratio	P/E Ratio	ROA
Loan-to-Deposit	0.0843 (0.249)	-18.0637 (22.612)	-0.0176* (0.010)
Cost-to-Income	-0.0037*** (0.001)	0.1849 (0.187)	-0.0000 (0.000)
Capital Adequacy	0.0221** (0.009)	0.0330 (0.469)	0.0004 (0.000)
Constant	-1.1370 (1.755)	72.7987 (73.892)	-0.0205 (0.042)
Observations	284	284	284
R-squared (Within)	0.105	0.104	0.136

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()

Table A-5 Panel regression results for the ESG score, post-COVID Regression (2020-2023), with robust standard errors

Variable	P/B Ratio	P/E Ratio	ROA
ESG Score	0.0023 (0.004)	-0.1651 (0.135)	0.0000 (0.000)
Lagged ESG Score	0.0031 (0.003)	0.0400 (0.114)	0.0000 (0.000)
Bank Size	0.2195 (0.189)	6.9655* (4.090)	0.0058 (0.004)
Leverage	0.0628 (1.223)	-29.0965 (33.822)	0.0313 (0.023)
NPL Ratio	-0.0114 (0.007)	0.1540* (0.092)	-0.0008*** (0.000)

Variable	P/B Ratio	P/E Ratio	ROA
Loan-to-Deposit	-0.7326** (0.293)	-33.0474** (12.406)	-0.0162** (0.007)
Cost-to-Income	0.0008** (0.000)	0.0214 (0.026)	0.0000*** (0.000)
Capital Adequacy	0.0206 (0.014)	0.4591 (0.372)	0.0008*** (0.000)
Constant	-2.0752 (2.600)	-45.8227 (51.782)	-0.0796 (0.059)
Observations	284	284	284
R-squared (Within)	0.113	0.083	0.320

$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***; Robust standard errors in ()