Journal of Infrastructure, Policy and Development 2024, 8(7), 5272.
https://doi.org/10.24294/jipd.v8i7.5272

Article

The moderating impact of loan loss reserves on the relationship between ESG performance and bank value: Empirical evidence of Thai listed banks

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CITATION

Gunnarapong N, Boonyanet W, Jangphanish K. (2024). The moderating impact of loan loss reserves on the relationship between ESG performance and bank value: Empirical evidence of Thai listed banks. Journal of Infrastructure, Policy and Development. 8(7): 5272. https://doi.org/10.24294/jipd.v8i7.5272

ARTICLE INFO

Received: 17 March 2024
Accepted: 18 April 2024
Available online: 29 July 2024

Abstract: The study aims to investigate the relationship between ESG (Environment, Social, Governance) performance on bank value when moderated by loan loss reserves. Using all 11 Thai listed banks for the period 2017–2021, data were collected from Bloomberg database, the official website of the Stock Exchange of Thailand (SETSMART), and Bank of Thailand, totalling 55 observations. The selected CAMEL indicators served as the control variables. Multiple linear regression and conditional effect analyses were executed using Tobin's Q as a bank value. This study carefully tested the validity of the dataset, including fixed and random effects. The research outcomes demonstrate the interaction between ESG performance and loan loss reserves has a notably negative effect on the association between ESG performance and bank value. Subsequent analysis reveals that the negative influence of ESG performance on bank value is more pronounced with higher levels of loan loss reserves. These findings have important implications for bankers, investors, and policymakers, offering insights into the dynamics of ESG and loan loss reserves considerations.

Keywords: camel; ESG; Thailand; loan loss reserves; free cash flow

1. Introduction

ESG (Environmental, social, and governance) is a concept that has been created and modified for many important scenarios and been considered as a viable tool for measuring sustainability (Clément et al., 2022). Companies that prioritize environmental stewardship, social responsibility, and good governance practices may be better equipped to adapt to changing market conditions, regulatory requirements, and stakeholder expectations, which could contribute to their long-term success, value creation, and competitive advantage (Azmi et al., 2021; Buallay, 2019; Chiaramonte et al., 2022). Moreover, implementing ESG practices can result in cost reductions and improved operational efficiency. For instance, investing in energy-saving technologies can lower energy expenses, while enhancing employee well-being can boost productivity and reduce turnover costs, ultimately benefiting the company's financial position and overall value. ESG performance may encourage more investment and secure financing more easily, which could positively impact investors' and other stakeholders' valuations of a company (Chang et al., 2021). Finally, interacting with stakeholders such as investors, employees, customers, and communities regarding ESG concerns can build trust and consolidate relationships. This in turn can lead to a range of benefits such as improved customer loyalty, employee satisfaction, and community support, all of which can contribute to firm value (Bătaea et al., 2020).

The development of ESG practices in Thailand has gained momentum in the recent years. One of the most important issues that encouraged ESG was the recent COVID-19 pandemic, which triggered the shutdown of many societies and their economies; thus, sustainability suddenly became very real. There is growing interest among banking businesses and investors in ESG factors. This trend is driven by recognition of the importance of sustainability and corporate responsibility in generating long-term value (BOT, 2023b; TBA, 2022). In 2022, Thailand took steps to promote ESG practices through the government's regulatory framework. The Securities and Exchange Commission (SEC) replicates the ESG Principles of the Organisation for Economic Co-operation and Development (OECD) (OECD, 2023) and has introduced rules requiring listed companies in their annual reports to reveal information related to ESG factors. Additionally, the Stock Exchange of Thailand (SET) has implemented guidelines for ESG reporting. Many Thai companies, including banking businesses, have begun to integrate ESG considerations into their business strategies. Included here are initiatives related to environmental sustainability, social responsibility, and governance, for example, Siam Commercial Bank (SCB, 2023), and Kasikorn Bank (KBANK, 2023).

The above situation opens up research opportunities to scrutinize the informative value of ESG performance on bank value. Prior studies have mainly focused on the direct relationship between ESG and firm value (Bătaea et al., 2020; Ersoy, 2022; Menicucci and Paolucci, 2023). However, this study intends to expand on previous studies by adding a moderating power of loan loss reserves to the relationship between ESG and firm value. Loan loss reserves are vital indicators of asset quality in banking businesses. Loan loss reserves are crucial for bank value. By setting aside reserves, banks and financial institutions can manage credit risk better and ensure they have sufficient funds to cover potential losses. Additionally, having adequate loan loss reserves enhances a firm's financial stability. Loan loss reserves can also be used for earnings management. Banks may adjust their reserves to smooth earnings or meet specific financial targets. Previous studies have long considered loan loss reserves as having a direct effect on bank value (Elnahass et al., 2014; Hehde and Kozlowski, 2021; Sood, 2012). In fact, reserves may be considered as having both direct and moderating effects on bank value. Consequently, this study intends to scrutinize the role of loan loss reserves given that previous studies tended to exclude the banking sector from their analyses. Furthermore, such research has not yet been conducted in Thailand. This study intends to fill this research gap by conducting a study exploring the moderating power of loan loss reserves on the relationship between ESG performance on bank value.

This study closes the lack of knowledge in existing literature in emerging economies, especially Thai banks as the representatives of an emerging market economy. As well, the study successfully reports the vital role of loan loss reserves as an example of the incremental value between ESG performance and bank value. It is found that, firstly, the moderating effect of loan loss reserves on the relationship between ESG performance and bank value was negative. The negative impact of ESG performance on bank value is stronger for firms with higher loan loss reserves. Furthermore, CAMEL can take into account the variables when studying the banking industry's efficiency. Due to fact that the population of the dataset is limited, to meet

the regression assumptions, this study carefully tested the dataset using various statistical techniques to confirm data validity.

The rest of this paper is organized as follows. In Section 2, a review of the published studies on this topic and hypothesis formulation are documented. Included here is the background of ESG in Thailand, ESG as the variable of interest, and loan loss reserves as a moderating variable, whereas CAMEL is explained as a control variable. In Section 3 the research design is explained. Section 4 deals with the descriptive statistics and empirical findings. Finally, Section 5 concludes the results of this study and summarizes the main themes covered in this paper.

2. Literature review and hypotheses

2.1. Underpinning theory

The primary aim of this study is to examine how ESG scores shape firm performance, with a focus on the moderating effect of loan loss reserves. The theoretical framework is based on voluntary disclosure theory, which seeks to explain why companies choose to disclose information beyond what is required by government regulations. According to this theory, companies engage in voluntary disclosure to reduce information asymmetry with stakeholders, thereby lowering agency costs. Additionally, voluntary disclosure can enhance a company's reputation and credibility among stakeholders (Leftwich et al., 1982).

In the realm of ESG, voluntary disclosure theory suggests that companies have the autonomy to determine the extent of information they share about their environmental, social, and governance practices. This decision-making process can be influenced by a variety of factors, including regulatory mandates, pressure from stakeholders, and strategic considerations. For instance, businesses may choose to disclose their ESG practices voluntarily to bolster their reputation, attract investors with a focus on social responsibility, or manage risks associated with environmental or social issues. The degree of voluntary disclosure can vary significantly across companies and industries, reflecting differences in their ESG priorities, approaches to disclosure, and the expectations of stakeholders. Research in this field often explores the drivers and outcomes of voluntary ESG disclosure, such as its effects on firm valuation, cost of capital, stakeholders' attitudes among others (Albitar et al., 2022; Chung et al., 2023).

2.2. ESG and bank value

The adoption of ESG principles in the Thai banking industry is gaining momentum, and it has been driven by both global trends and local initiatives. The impact of ESG on Thai banks can be explained as follows. Thai banks are increasingly focusing on reducing their environmental footprints, which means efforts to minimize energy consumption, reduce greenhouse gas emissions, and encourage sustainable practices within their procedures. Some banks have started offering 'green' finance products to support environmentally friendly projects or schemes. Thai banks actively engage in promoting social responsibility such as initiatives to support financial inclusion, like providing banking services to

underserved communities or minorities and offering microfinance programs. Banks are also involved in various community development projects, supporting education, healthcare, and other social activities. Good governance is a priority for the Thai banks. They are working to strengthen their governance structures, ensure transparency/full disclosure and accountability, and enhance their risk-management practices. Banks also improve their disclosure and reporting practices to provide stakeholders with more comprehensive information on their governance policies and practices.

Thai banks are increasingly integrating ESG factors into their decision-making processes. This includes considering the ESG criteria in risk assessments, credit evaluations, and investment decisions. By incorporating ESG considerations, banks can better manage risk, identify opportunities, and improve their long-term sustainability. Thai banks are improving their reporting and disclosure practices related to ESG. They offer more detailed and honest information regarding ESG performance, encompassing environmental impacts, social initiatives, and governance practices. Enhanced reporting helps banks build trust with stakeholders and demonstrates their commitment to ESG principles. Overall, ESG plays an increasingly critical role in shaping Thai banks' practices and strategies. By adopting ESG principles, banks in Thailand can not only improve their financial performance but also contribute to the sustainable development of the country.

This study adopts Tobin's Q as bank value measurement. Tobin's Q is a metric that evaluates the market worth of banks compared to their book value. This is significant because banks typically possess a blend of tangible assets such as loans and securities, alongside intangible assets like brand reputation and software. Utilizing Tobin's Q can offer understanding into how the market views a bank's potential for growth, its risk exposure, and its overall performance. A high Tobin's Q might indicate that the market highly values the bank's assets and potential for growth, whereas a low Tobin's Q could suggest that the market is apprehensive about the bank's performance or future prospects (Buallay, 2019; Miralles-Quirós et al., 2019).

Prior studies have been carried out to observe the relationship between ESG and bank value. For example, Ahmed et al. (2018) discovered that banks primarily address basic environmental, social, and governance (ESG) factors outlined by regulators in a qualitative way. However, they did not integrate the advanced ESG criteria necessary for sustainable and effective credit risk management. Their research indicated that banks leading the way in integrating ESG factors into lending decisions were rewarded with improved financial performance. Shakil et al. (2019) show that the environment pillar and social pillar scores positively affect ROE, but the governance pillar scores do not influence banks' ROE. Miralles-Quirós et al. (2019) found that the environment and the governance performance positively relate to bank value, but produces a negative effect on Tobin's Q. Buallay (2019) reported that ESG is significantly related to bank performance. Furthermore, the association between ESG performance varies if assessed individually. The study found not only those environmental activities positively affected ROA and Tobin's Q, but also indicated that social and environmental performance impacts financial performance.

Bătaea et al. (2020) found ESG performance significantly related to financial performance. They suggest that banks and regulators could use this information to identify areas for improvement or action to enhance both ESG and financial performance, thereby increasing shareholder value. Tommaso and Thornton (2020) argue that ESG performance is linked to banks' taking of risks, regardless of whether banks are low or high risk-takers. However, ESG performance is negatively correlated with bank value because ESG initiatives can lead to overinvestment, diverting scarce resources from more productive uses. Azmi et al. (2021) observe a positive impact of low ESG activity levels on bank value. Furthermore, environmental performance has the greatest effect on bank value.

Ersoy et al. (2022) identified a reversed U-shaped association between ESG activities and stock price, and a U-shaped correlation between social and environmental activities and stock value. Chiaramonte et al. (2022) discovered that high ESG performance, including sub-activities, curtailed bank instability during periods of financial distress, especially for institutions with higher ESG ratings. Longer ESG disclosures were also found to have greater stabilizing effects during periods of financial turmoil. Yuen et al. (2022) noted that ESG activities might reduce banks' operating results during the COVID-19 pandemic. This finding supports the trade-off hypothesis that ESG activities increase costs. They also note a U-shaped association between ESG activities and banks' operational results, indicating prospective long-term improvements from ESG activities. Gholami et al. (2022) discovered that ESG performance is positively related to net income, with substantial differences between non-financial and financial businesses. In their work, Kurniawan and Kim (2023) concluded that ESG factors do not significantly affect the market value of banks in the ASEAN region. According to Egidio et al. (2023), improvements in environmental scores reduced the probability of default for firms, although riskiness increased when controlling for industry and the stock index. They suggest that banks should consider ESG scores in lending practices modified by industry or stock volatility. Menicucci and Paolucci (2023) reported that while ESG policies had a negative impact on banks' operational and market performance, emissions and waste reductions positively affected financial performance. However, better product responsibility undermines accounting performance. Citterio and King (2023) demonstrated that ESG improved the predictive capability of their distress identification model, particularly in correctly identifying distressed or defaulted banks as healthy banks.

Prior research has also explored the informational benefits of ESG in various contexts. For instance, Chang et al. (2021) suggested that banks in developed Asian economies enhance cost-efficiency through environmentally friendly practices, while those in developing Asian economies improve cost efficiency through socially responsible activities and enhanced governance. La Torre et al. (2021) concluded that regulatory bodies should prioritize monitoring and addressing ESG risks in banks over ESG opportunities. This approach aims to compel banks to embrace a new ESG business model, especially in the initial phases of transitioning to sustainability. Adu et al. (2022) found that executive pay raises lead to greater disclosure of sustainable banking practices. However, higher executive compensation was linked to poorer environmental performance.

Furthermore, corporate governance mechanisms significantly influence the relationship between executive remuneration and sustainable banking performance. Danisman (2022) demonstrated that during the COVID-19 pandemic, banks with higher ESG scores exhibited resilient stock returns. Izcan and Bektas (2022) discovered a notable inverse correlation between banks' overall ESG scores and their individual risk levels, particularly for medium- to high-risk categories. This relationship intensifies when bank riskiness increases. Suttipun (2023) identified a negative correlation between ESG performance and corporate financial risk. According to signalling theory, this relationship suggests that improving ESG performance can mitigate corporate financial risk. Drago et al. (2024) identified French and British banks, but particularly Italian ones, as leaders in implementing top-tier international ESG practices among European institutions. Their study underscores the development of sustainable banking frameworks, highlighting the growing focus on disclosing ESG indicators and their alignment with real-world outcomes.

In summary, ESG principles are increasingly being embraced by Thai banks, spurred by both international trends and local efforts. These banks are actively working to reduce their environmental impact, introducing eco-friendly finance products, and advancing social causes like financial inclusion and community development or philanthropic schemes. They are also integrating ESG considerations into their decision-making processes and are improving their reporting practices. Studies suggest that incorporating ESG principles can enhance financial performance and firm value, although the effects on bank value may differ based on the nature of the ESG initiatives and the circumstances in which they are applied.

2.3. Loan loss reserves as having a moderating impact on the relationship between ESG performance and bank value

This study aims to observe the moderating roles of loan loss reserves on the relationship between ESG performance and bank value. Loan loss reserves are crucial to firm value for several reasons. For example, loan loss reserves act as buffers against potential losses resulting from loan defaults. By setting aside reserves, banks and financial institutions can manage credit risk better and ensure that they have sufficient funds to cover potential losses. Additionally, having adequate loan loss reserves enhances a firm's financial position. It provides investors, creditors, and regulators with confidence in a company's ability to withstand potential losses, which can positively help its credit rating and overall financial health. Investors pay close attention to a firm's loan loss reserves becausae they indicate the firm's risk management practices and financial state. Adequate reserves can enhance investor confidence and attract capital, whereas insufficient reserves can raise red flags and erode investor trust. Loan loss reserves can also be used for earnings management. Firms may adjust their reserves to smoothen earnings or meet specific financial targets. However, the aggressive or inappropriate use of loan loss reserves can distort the true financial position of a firm and mislead investors.

Previous studies have examined the information value of loan loss reserves from time to time. For example, Sood (2012) finds compelling evidence of income-

smoothing behavior through the use of loan loss reserves, which results in increased profitability. Additionally, banks utilize loan loss reserves more extensively during crisis periods to boost income artificially. Elnahass et al. (2014) discovered that loan loss reserves positively boosted bank valuation in North Africa and the Middle East. They concluded that the signaling effect of these reserves helped investors assess banks' value and stability. Hegde and Kozlowski (2021) observed that during economic downturns, when default risks rise, higher loan loss reserves are associated with negative abnormal returns. However, they also discovered that in favourable economic conditions, banks with greater provisions saw notably higher earnings and loan growth in the subsequent year. Conversely, these banks encountered a rise in non-performing loans (NPLs) following periods of financial distress.

In summary, previous research indicates that loan loss reserves are utilized for income-smoothing, especially during crises, which can enhance profitability. Moreover, these reserves have a positive impact on bank valuation. Yet, during economic downturns, higher reserves have been linked to negative abnormal returns. Conversely, in favorable economic conditions, banks with larger provisions often see increased earnings and loan growth, though this may be accompanied by a rise in non-performing loans after periods of financial strain. Based on the above findings in Section 2.2 stating the ESG is considered as a factor influencing firm value and Section 2.3 stating that loan loss reserves are deemed to be factors influencing profitability, the following hypothesis is put forward:

Hypothesis: Loan loss reserves moderate the relationship between ESG performance and bank value.

2.4. Control variables

To decrease the probability of omitted variable of concern, the analysis encompasses control variables so that misinterpretation of outcomes does not become an issue (Bartov et al., 2000). This study adopted selected CAMEL ratios as control variables for the analysis. The Federal Financial Institutions Examination Board introduced CAMEL in 1979 to evaluate the sustainability of individual banks in the USA. Many academic studies have examined whether CAMEL provides investors with informative value. Prior research has found that CAMEL delivers the conditions and bank performance. Added to this, CAMEL is useful for supervisory monitoring of banks' circumstances (Hirtle and Lopez, 1999). Examples from prior studies found that the informative value of CAMEL is as follows. Taherinia and Baqeri (2018) find that banks' profit volatility is influenced by factors such as bank reserves, capital adequacy ratio, and growth opportunities. Nguyen et al. (2020) demonstrate that asset quality, capital adequacy, liquidity, and management efficiency are key determinants of commercial bank performance in emerging markets. Nugroho et al. (2020) highlighted the significant impact of capital adequacy ratio on share price. In conclusion, prior research suggests that the CAMEL framework provides valuable insights into different aspects of the banking industry. Therefore, this study aimed to discover the informative value of CAMEL on bank value as a control variable. **Table 1** summarizes the variables in this study.

Table 1. Summary of variables.

Variables	Measurement	Previous studies
Dependent		
Tobin's Q	(Market value of equity + book value of liabilities) divided by book value equity	Miralles-Quirós et al. (2019); Buallay (2019)
Independent		
ESG	ESG scores	Kurniawan and Kim (2023); Egidio et al. (2023); Menicucci and Paolucci (2023)
Moderator		
LLR (%)	Loan Loss Reserves divided by total loans	Sood (2012); Elnahass aet al. (2014); Hegde and Kozlowski (2021)
Control		
FCF	Free Cash Flow divided by the number of common shares	Jumran and Hendrawan (2021)
DE	Total debt divided by total equity	Safitri et al. (2020)
LD	Total loans divided by total deposits	Hirtle and Lopez (1999)
EPS	Net income divided by the number of common shares	Taherinia and Baqeri (2018)
TA	Total Assets	Nguyen et al. (2020)

3. Research design

This is an empirical study. Data collection was based on all commercial banks listed on the Stock Exchange of Thailand, for the years 2017 to 2021. The reasons for employing the dataset is because of data availability starting from 2017 and before ESG became mandatory as part of disclosure requirements in 2022. Other banks, including foreign and Thai government policy banks are not included in the dataset because they are liaison branches (not full branches) of their parent companies abroad, and no market value information is available for them.

This study selects Thai listed banks as a dataset because they play a key role in the Thai economy, holding a substantial amount of financial assets, and their business activities are connected to important forces in the economy, these being household reserves and commercial sector funds. In addition, banking businesses have been supporting other businesses like real estate enterprises (Mahathanaseth and Tauer, 2019; Prayoonrattana et al., 2020). The banking industry in Thailand is generally profitable, with banks reporting strong earnings and have been recognized as fundamental to the economy (BOT, 2023a).

Inclusive data on ESG scores, bank financial information, and bank value were extracted from Bloomberg database, the SET Market Analysis and Reporting Tool (SETSMART) and the official website of Bank of Thailand. Involved here were 11 banks with the total observations amounting to 55. Bloomberg's ESG Data Service provides comprehensive, reliable and objective ESG data worldwide. They collect data from various sources like disclosures, filings, news, and NGOs, and also assess the materiality of ESG factors based on industry and stakeholder priorities. A proprietary methodology to calculate scores is employed. These scores are compared to industry peers for context and are regularly updated to reflect new data and changes or improvements (Bloomberg, 2023). Data analysis employed both

descriptive statistics and multiple regression analyses. This study employed Tobin's Q to measure bank value. Variables of interest included ESG performance and loan loss reserves. In addition, the selected CAMEL as control variables is included in the analysis. Once the collection was completed, the regression assumptions were carefully tested. Pooled OLS, fixed effects, and random effects served to generate the analysis results. **Figure 1** below displays the conceptual framework and regression model specifications.

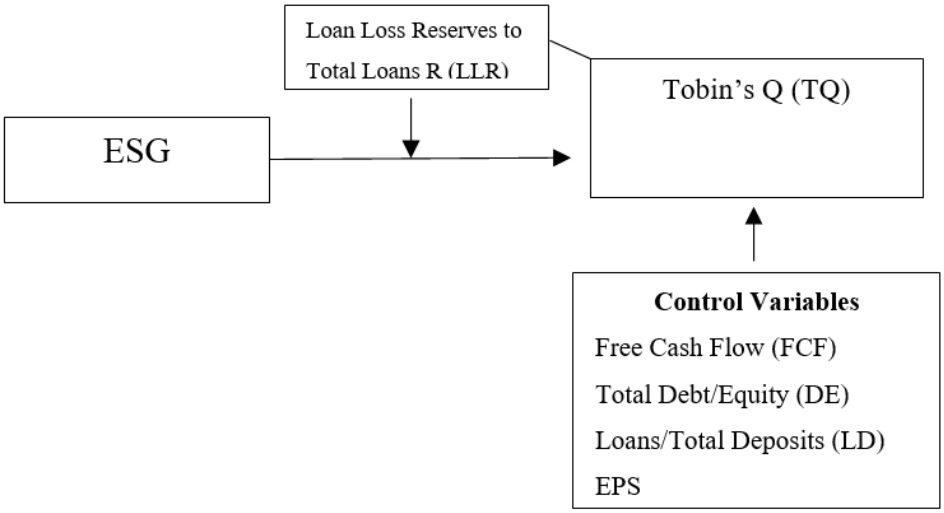

Figure 1. Conceptual framework.

Model specification:

$$\text{TQ} = \alpha + \beta_1 FCF + \beta_2 DE + \beta_3 LD + \beta_4 EPS + \beta_5 TA + \beta_6 ESG + \beta_7 LLR + \beta_8 (LLR \times ESG) + \varepsilon$$

4. Empirical results

4.1. Descriptive statistics

Table 2 shows the variables and their definitions as well as the descriptive statistics of the variables. The attention-grabbing information related to listed commercial banks during 2017–2021 in Thailand reveals some intriguing and fundamental information. It emerges that Tobin's Q ranges from 0.81 to 1.69 with the average of 1.04 (*SD* = 0.17) and median equals to 0.99. EGS performance ranges from 33.28 to 78.36 with an average of 49.36 (*SD* = 10.50), and the median was 46.36. Loan loss reserves (LLR) ranged from 2.19% to 9.38 with an average of 4.91% (*SD* = 1.93), and the median was 4.98. Free cash flow (FCF) ranges from -61.06 to 87.79 per share with an average of 9.13 per share (*SD* = 23.11), and the median equals 1.22 per share. Total debt to total equity (DE) ranges from 37.78 to 217.46%, with an average of 100.75% (*SD* = 44.90) and the median equals 95.13. Total loans to total deposits (LD) ranged from 82.49 to 144.57% with an average of 97.19% (*SD* = 28.27), and the median was 99.32. Earnings per share (EPS) ranges from –5.74 to 18.55 per share with an average of 5.94 per share (*SD* = 5.99), and the median equals 5.02 per share. Total assets (TA) range from 0.08 to 4.42 trillion baht

with the average being 1.73 trillion baht (SD = 1.45) and the median equates to 1.78 trillion baht.

Table 2. Descriptive statistics.

Variable	Mean	SD	Median	Min	Max
TQ	1.04	0.17	0.99	0.81	1.69
ESG	49.36	10.50	46.78	33.28	78.36
LLR (%)	4.91	1.93	4.98	2.19	9.38
FCF (Baht per share)	9.13	23.11	1.22	–61.06	87.79
DE (%)	100.75	44.90	95.13	37.78	217.46
LD (%)	97.19	28.27	99.32	82.49	144.57
EPS (Baht per share)	5.94	5.99	5.02	–5.74	18.55
TA (Trillion Thai Baht)	1.73	1.45	1.78	0.08	4.42

4.2. Regression results and analysis

Because the study employs time series and cross-sectional time data, the analysis is divided into Pooled OLS, fixed effects, and random effects. **Table 3** presents the regression results of the analysis. The best analysis outcome is the fixed effects method regarding the Hausman test (p-value = 0.00). It is evident that the overall regression analysis indicates that the Adjust R^2 equal to 0.3149. This means that the variable can explain the bank value at 31.49%. The interaction between ESG performance and loan loss reserves significantly and negatively relate to Tobin's Q (B = –0.0002, p < 0.001). ESG performance significantly relates to Tobin's Q in a positive way (B = 0.0057, p < 0.001). Referring to the control variables, the fixed effects analysis indicates that free cash flow (FCF) significantly relates to Tobin's Q positively (B = 0.007, p < 0.001), while loan loss reserves (LLR) and total assets (TTA) significantly and negatively relate to Tobin's Q (B = –0.0425, p < 0.05, B = –0.0307, p < 0.001, respectively).

Table 3. Regression results of ESG performance on bank value when moderated by loan loss reserves.

Variables	Pooled OLS	Fixed effects	Random effects
Dependent: Tobin's Q	B(t)	B(t)	B(t)
(Constant)	0.2864	0.9608**	0.3425
	(0.1662)	(0.4286)	(0.2523)
Control variable			
FCF	0.0013***	0.0007***	0.0011*
	(0.0003)	(0.0003)	(0.0005)
DE	−0.0079	−0.0009	−0.0074
	(0.0058)	(0.0035)	(0.0059)
LD	0.0011*	0.0004	0.0009
	(0.0005)	(0.0031)	(0.0009)
EPS	0.0018	0.0008	0.001
	(0.0027)	(0.0092)	(0.0018)

Table 3. (*Continued*).

Variables	Pooled OLS	Fixed effects	Random effects
LLR	−0.0131	−0.0425*	−0.0166
	(0.0138)	(0.0203)	(0.0171)
TA	−0.0083	−0.0307***	−0.0096
	(0.0085)	(0.0008)	(0.0123)
Independent variable			
ESG	0.0064***	0.0057***	0.0059***
	(0.0012)	(0.0008)	(0.001)
Moderator effect			
ESG*LLR	0.0003**	−0.0002***	0.0003
	(0.0002)	(0.0001)	(0.0002)
Dummy YEAR			
2021	−0.0819	–0.0712***	−0.0829***
	(0.0081)	(0.0038)	(0.0079)
2020	−0.0225***	"–0.0180***	−0.0217**
	(0.0054)	(0.0061)	(0.0073)
2019	−0.1060***	–0.0909***	−0.1039***
	(0.0112)	(0.0221)	(0.0134)
2018	−0.0375***	−0.0420	−0.0355*
	(0.0092)	(0.0431)	(0.0154)
Model summary	Average absolute correlation = 0.383	Average absolute correlation = 0.386	Average absolute correlation = 0.396
R square	0.3293	0.5098	0.2712
adj-R square	0.1633	0.3149	0.1616
R square change	0.1633	0.1516	–0.1533
VIF	1.042–1.272	1.042–1.318	1.037–1.783
F-Statistics	1.600	2.174	2.103
Dubin Watson	1.7863	1.9808	2.304
Hausman test (p-value = 0.00)	NO	YES	NO

Notes" **p*-value < *0.05*, ** < *0.01*, ***< *0.001* (Standard errors); 1) ESG: ESG scores; 2) LLR: loan loss reserves; 3) FCF: Free cash flow; 4) DE: Total debt to total equity; 5) LD: loans to deposits; 6) EPS: earnings per share; 7) LLR: Loan loss reserve; and 8) TA: Total assets.

4.3. Further analysis: The incremental value of loan loss reserves on ESG performance

Conditional effects of ESG performance at values of the loan loss reserves are applied to identify the conditional impacts of ESG performance on bank value at different levels of the control variables. Loan loss reserves (LLR) are a reasonable moderator among other control variables. The result is shown in **Table 4**. The *R*-squared change is 10.63% ($p < 0.01$) when LLR moderated ESG performance. This means that loan loss reserves add incremental value to the association between ESG performance and bank value. The analysis shows that the impact of ESG performance on bank value is moderated by loan loss reserves (LLR). Specifically:

1) When LLR levels were low (one standard deviation below the mean), the interaction effect was statistically insignificant at the 0.05 level (p = 0.1681), with a coefficient of 0.0377.
2) When LLR is at a moderate level (the mean) or high level (one standard deviation above the mean), the interaction effect is significantly negative at the 0.01 level, with a coefficient of –0.041.
3) When LLR is at a high level (one standard deviation above the mean), the interaction effect is significantly negative at the 0.01 level, with coefficient of –0.1196.

In summary, the association between ESG performance and bank value is moderated by LLR, demonstrating a stronger negative effect when the LLR proportion declines.

Table 4. Conditional effects of ESG performance on bank value at different levels of loan loss reserves.

	R2-change	**F**	**df1**	**df1**	***p***
X*W	0.1063	7.6127	1.000	47	0.0082
LLR		**Effect**	**se**	***t***	***p***
4.8352 (low)		0.0377	0.0269	1.3998	0.1681
11.3472 (moderate)		–0.041	0.0146	–2.8104	0.0072
17.8591 (high)		–0.1196	0.0364	–3.286	0.0019

Note: Focal predictor: ESG (X), Moderator variable: LLR (W)

To illustrate the varying impacts of ESG performance on bank value across different LLR levels (high, moderate, and low), the conditional effects are plotted in **Figure 2**. The interaction effect between LLR and ESG performance means that bank value decreases as LLR levels increase, from low to moderate to high. Specifically, higher ESG performance leads to a greater decline in bank value when LLR is high than when it is at a moderate or low level. The conditional effect of ESG performance on bank value is –0.1196, –0.041, and 0.0037 when LLR is at high, moderate, and low levels, respectively.

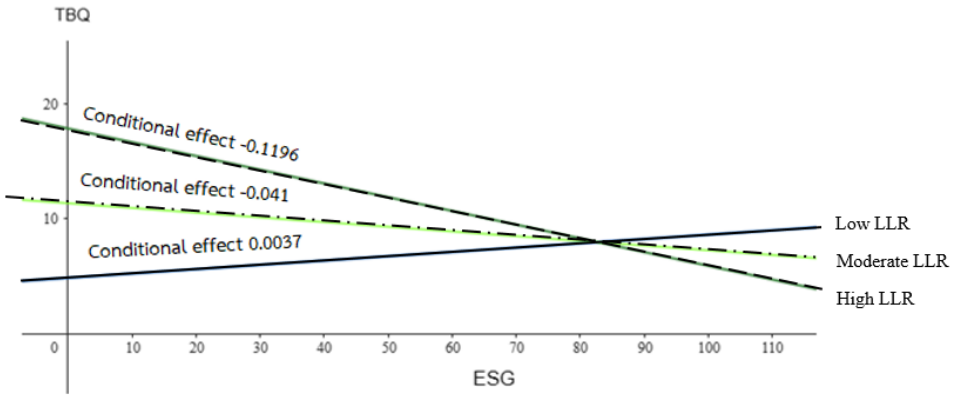

Figure 2. Conditional effects of ESG performance on bank value at different loan loss reserves levels.

5. Discussion

The most significant finding of this study is that loan loss moderates the relationship between ESG performance and bank value. This finding supports the hypothesis devised for this study. Possible explanations are as follows. First, incorporating ESG factors into risk assessments could potentially lead to higher loan loss reserves if banks perceive certain loans as riskier because of environmental or social factors. This could undermine profitability and capital adequacy ratios. Additionally, integrating ESG factors into existing financial models used for loan loss reserves can be complex. Banks may need to develop new models or modify existing ones to incorporate ESG considerations effectively. Banks may discover after the models are implemented that their customers cannot meet the ESG requirement, resulting in more loan loss reserves. It should be noted that the regulatory requirements related to ESG reporting and disclosure are still evolving. Banks themselves may encounter challenges in meeting these requirements and ensuring compliance while effectively managing their loan loss reserves. Furthermore, their clients may face challenges in meeting these results if the implementation of ESG is costlier. Finally, investors increasingly consider ESG factors when evaluating firms to invest in. While higher loan loss reserves may have a short-term impact on bank value, investors may view strong ESG practices positively, which could enhance the long-term value of a company.

5.1. Theoretical contributions

As stated earlier in this paper, this study aims to examine whether loan loss reserves moderate the relationship between ESG performance and market-based performance of Thai listed banks. The result shows that loan loss reserves moderate the relationship between ESG performance and bank value. This finding supports the voluntary disclosure theory. However, this study finds that the implementation of ESG alone may not increase bank value, while loan loss reserves moderate the relationship between ESG performance and bank value. Banks may consider ESG activities as operational costs when implementing them, while loan loss reserves are greatly important. If these two factors are simultaneously incurred, banks are more likely to scrutinize the outcome of their operational procedures and processes.

5.2. Practical implications

The implications of the regression outcomes and conditional effect analysis are as follows. Bankers are recommended to consider that ESG performance is a vital policy of business strategies and should be integrated into their operations on a daily basis. This study also recommends that the implementation of ESG should be employed as a whole rather than as an individual component. Loan loss reserves enhance bank value, together with ESG performance, so in effect they increase bank value. However, the negative impact of ESG performance on bank value is stronger when the loan loss reserves increase. Bankers should carefully consider to what extent ESG performance and loan loss reserves should be combined to maximize their institution’s value. Banks which have a policy to prioritize ESG considerations

can enhance their status and brand value. This should increase customer loyalty, attract new customers, and improve relationships with investors and stakeholders.

Additionally, by incorporating ESG factors into bank operations, they make it easier to identify and govern risks related to environmental, social, and governance practices. This can avoid the potential financial losses and reputational damage associated with poor ESG performance. Furthermore, regulatory requirements related to ESG are evolving and banks that proactively adopt ESG practices can stay ahead of regulatory changes or what is happening in the market. This can help banks avoid the penalties and costs associated with non-compliance. Finally, by promoting responsible lending practices and supporting environmentally and socially sustainable initiatives, banks can contribute to long-term sustainability, which benefits both the environment and society. When implementing ESG, banks should consider other combinations. This study encourages banks to consider loan loss reserves as one of the key influencing factors that increases firm value.

For investors, ESG factors can be indicators of risk that may guide a company's long-term financial operations. For example, poor environmental practices can lead to regulatory fines or reputational damage. Banks exhibiting strong ESG performance are often better positioned to create long-term value. This can be achieved through enhanced brand reputation, attracting, and retaining top talent, and mitigating the risks related to climate change and social issues. Many countries are implementing regulations that require companies to disclose their ESG performance. Investors who understand these regulations can assess the risks and opportunities associated with investing in a particular company or sector better.

For regulators (i.e., SEC, and central banks), ESG factors can have material impacts on the financial system. For example, climate change risk can affect the stability of finance institutions and markets. Regulators should have policies to assess and mitigate these risks by monitoring ESG performance. Regulators have a duty to protect investors from misleading or incomplete information. Given the growing interest in ESG investing, ensuring that companies accurately disclose relevant ESG information is essential for protection of investors. ESG factors contribute to systemic risk in the financial system. For example, social issues such as income inequality can lead to social unrest, which has wider political and economic implications. Regulators must monitor and address these risks to maintain financial stability.

5.3. Limitations

This study has some limitations. Conducted in the Thai capital market as a representative of an emerging economy, it is advisable for researchers in other countries to replicate this study first and then tailor it to their respective countries. This step is crucial for validating the informative value of ESG performance in bank performance. Even if this study attempts to analyse ESG performance both combined and individually, the results are unsatisfactory. Further studies are recommended to explore ESG performance individually in case there is future development of ESG principles. Furthermore, given the dynamic nature of the factors influencing bank value, new factors should be incorporated into future analyses. External data,

including economic indicators (e.g., GDP and income per capita), stock exchange indices, and interest rates, should be considered. Additionally, examining variables such as shareholder structure and institutional investors, which can function as proxies for effective corporate governance mechanisms, would enhance the depth of the analysis.

6. Conclusions

This study examines the application of ESG performance in Thai banking businesses and its impact on bank value. As well, this paper extends previous research by introducing the moderating impact of loan loss reserves on the association between ESG performance and bank value. The analysis incorporates all Thai banks listed on the Stock Exchange of Thailand as representatives of an emerging market-based economy. This study contributes significantly to the existing literature in two ways. First, and critically, the moderating effect of loan loss reserves on the negative relationship between ESG performance and bank value is confirmed. Second, the negative effect of ESG performance on bank value is greater for firms with higher loan loss reserves. In other words, loan loss reserves enhance the association between ESG performance and bank value. Third, free cash flow significantly relates to bank value in a positive manner, whereas loan loss reserves and total assets significantly relate to Tobin's Q in a negative manner. This means CAMEL should be considered as control variables when scrutinizing bank performance.

Author contributions: Conceptualization, NG and WB; methodology, NG and WB; software, NG, WB and KJ; validation, NG and WB; formal analysis, NG and WB; investigation, NG and WB; resources, NG and WB; data curation, NG and WB; writing—original draft preparation, NG and WB; writing—review and editing, NG and WB; visualization, NG and WB; supervision, NG and WB; project administration, NG and WB; funding acquisition, no. All authors have read and agreed to the published version of the manuscript.

Data availability: All data which explains the results is available as part of the article and no additional sources data are required.

Conflict of interest: The authors declare no conflict of interest.

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Appendix

Model validity

The aim of evaluating validity is to determine the accuracy of the link between the measure and the trait it intends to measure. In this study, linear regression models were employed to assess the association between the independent variable (ESG performance) and dependent variable (firm value). Various tests were carefully conducted to ascertain whether the data obtained satisfied the assumptions of linearity.

The analysis starts by identifying the outliers. Owing to the small sample size, Huber's M-Estimator, which is recommended for outlier detection, was used. The results indicated that there were no outliers. Additionally, to ensure that the data approximated a normal distribution, both the Shapiro-Wilk parametric and Kolmogorov-Smirnov nonparametric tests were employed. These tests' null hypothesis assumes that the population follows a normal distribution; thus, a *p*-value below 0.05 rejects the null hypothesis, indicating non-normality in the data. The stability of these series is crucial for empirical research that utilizes time-series data. Autocorrelation may arise due to the no stationarity of the time series. To assess stationarity, unit root tests, including the parametric Augmented Dickey-Fuller test (ADF) and non-parametric Phillips-Perron test, were conducted. The strength of the linear model relies on the assumption that each independent variable is independent of the other variables. If this assumption is violated, then the linear model is inappropriate for parameter estimation. Collinearity diagnostics were used to assess this, specifically by calculating the tolerance quotient and variance inflation factor (VIF) for each independent variable. A VIF exceeding 10 indicates multicollinearity, which can compromise the validity (Gujarati and Porter, 2003).

The analysis outcomes in **Table A1**, denote that all variables have normal Kolmogorov-Smirnov/Shapiro-Wilk values below 0.05, suggesting normal distribution. However, the VIF values for all independent variables were below 10, indicating no collinearity issues in the study models. Additionally, the use of panel data resulted in autocorrelation, which was tested using the Durbin-Watson test with Cochrane-Orcutt correction. The Durbin values fall within the 1.5–2.5 range, meaning that there is no Cochrane-Orcutt autocorrelation in the model. **Table A1** demonstrates that the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are statistically significant at the 1% level, showing that the time-series data are in fact stationary. Finally, the study assesses homoskedasticity, a key assumption of regression models, using Breusch-Pagan (1979) and Koenker tests for heteroskedasticity. The *p*-value exceed 0.05, supporting the null hypothesis that these models do not tolerate heteroscedasticity.

Table A1. Validity tests.

Variables	**Labels Measurement**	**Normality Kolmogorov-Smirnov/Shapiro-Wilk (*p*-value)**	**Stationary ADF/Phillips Perron**	**Heteroscedasticity Breusch Pagen test (*p*-value)**	**Heteroscedasticity Koenker test (*p*-value)**
Dependent	Tobin Q	0.478	–7.4088***	0.0011	0.5087
Control	FCF	0.067	7.245***	0.2861	0.6236
	LD	0.241	3.420*	0.0019	0.1563
	DE	0.200	–2.980*	0.5583	0.7848
	LLR	0.085	–3.5874***	0.0099	0.2235
	EPS	0.074	–7.246***	0.4249	0.7126
	TTA	0.200	2.002*	0.0028	0.1571
Moderator	ESG	0.128	–6.546***	0.2861	0.6236
Interaction	ESG*LLR	0.220	–3.374**	0.2123	0.5592
	VIF 1.112–1.801		Durbin-Watson 1.537		

*p-value < 0.05, **p-value < 0.01, ***p-value < 0.001.

In addition, the Pearson correlation matrix of the variables in **Table 6** ranges from –0.343 to 0.435. Suggested here is that multicollinearity is not an issue.

Table A2. Correlation matrix of variables.

VARIABLES	TBQ	FCF	DE	LD	EPS	LLR	TA	ESG
TBQ	1							
FCF	0.207	1						
DE	–0.012	–0.040	1					
LD	0.264	0.017	0.405**	1				
EPS	0.219	0.327*	–0.343*	–0.007	1			
LLR	–0.101	0.218	–0.201	–0.159	0.435**	1		
TA	–0.057	0.109	–0.063	0.039	0.351**	–0.026	1	
ESG	0.348**	0.001	0.131	0.249	–0.062	–0.183	0.027	1

*, ** Correlation is significant at the 0.05 and 0.01 level, respectively.

Robustness Test (Specification tests after the results)

Table A3 presents the robustness of the results. Even if the study concludes that the fixed effects are considered the best techniques, indicated here is that all assumptions check of the fixed-effects results are qualified. The residual statistics illustrate that the error term indicates a normal distribution with the Kolmogorov Smirnov/Shapiro *(p*-value = 0.1015*)*. The Breusch-Pagan test for heteroscedasticity shows that the *p*-value = 0.6196 is high, meaning that heteroskedasticity is not significant. White's test for heteroskedasticity in the panel, *p*-value = 0.7921, shows that heteroskedasticity is not present in the panel (Jeong and Lee, 1999). The Wooldridge test (2002) for autocorrelation in the panel shows *p*-value = 0.3657. This implies two things: firstly, there is no first-order autocorrelation; and secondly, the CSD test of the panel cross-correlation test indicated no cross-correlation in the panel (*p*-value = 0.3598*)* (Pesaran, 2006). Finally, the CD test revealed no concern about cross-sectional dependence in the estimation (*p*-value = 0.3600).

Table A3. Assumption checks for robustness (*p*-value).

Assumption check	Fixed effects
Kolmogorov Smirnov/Shapiro-Wilk	0.1015
Breusch-Pagan test for heteroskedasticity	0.6196
White's test for heteroskedasticity	0.7921
Wooldridge test for autocorrelation	0.3657
CSD test for panel cross-correlation	0.3598
CD test for cross-sectional dependence	0.3600