

Green Financing, Board Gender Diversity, and Firm Value: The Moderating Role of Capital Adequacy Ratio in Indonesian Banks

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ABSTRACT

Purpose – This study aims to examine the effects of green financing and board gender diversity on firm value, as well as the moderating role of Capital Adequacy Ratio (CAR), in banking companies listed on the Indonesia Stock Exchange during 2021–2024.

Design/methodology/approach – This study employs a quantitative explanatory approach using panel data regression analysis. The sample consists of 47 listed banks observed over the 2021–2024 period, resulting in 188 firm-year observations. Firm value is proxied by PBV, while green financing, board gender diversity, and CAR serve as the main explanatory variables. Profitability, non-performing loans, and firm size are included as control variables.

Finding/Results – The results show that green financing and CAR have positive and significant effects on firm value. In contrast, board gender diversity has a negative and significant direct effect. The moderating analysis further reveals that CAR weakens the positive effect of green financing on firm value but strengthens the effect of board gender diversity on firm value.

Originality/Value – The study contributes to the sustainable finance and corporate governance literature by demonstrating that market valuation in the banking sector is shaped not only by sustainability and diversity initiatives, but also by the bank's underlying financial capacity. Practically, the findings suggest that banks should enhance the credibility of green financing strategies and ensure that board gender diversity is embedded more substantively within governance structures.

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1. Introduction

Financial institutions are under growing pressure to strike a balance between strong financial performance and their responsibilities to society and the environment as the world economy moves toward sustainability. This assumption is especially important in developing markets where banks play a dual role as facilitators of finance and strategic stewards of funds for long-term growth. Banks in Indonesia are under pressure to prove that sustainability-focused projects can bring in real money instead of just making a statement about how serious they are about environmental and social responsibility (Zakari & Khan, 2022; Liu & Wu, 2023).

One of the most prominent steps that banks can take to back initiatives that are good for the environment is through green financing, which is part of this agenda. According to previous research, green initiatives have the potential to increase a company's value. This is because they boost reputation, lessen environmental risk, and help enterprises meet the expectations of both regulators and investors (Jiang et al., 2022; Lai et al., 2022). Financial sector research also suggests that green banking disclosure and sustainable finance might boost firm value potential (Purwanti, 2024; Puspitasari & Firmansyah, 2025). However, you can't count on instantly reaping the advantages. Value relevance of green financing is an open empirical question due to potential high monitoring costs, longer payback periods, and concerns over implementation credibility. This is especially true in developing markets where sustainability-conscious investors and institutional support are still in the early stages of development (Baharudin & Arifin, 2023; Tengfei & Ullah, 2024).

Internal governance quality, particularly gender diversity on boards, may also influence firm value. Chatterjee and Nag (2022) and Lawrence and Raithatha (2023) found that boards with more gender diversity had better strategic viewpoints, stronger monitoring, and higher-quality decisions, which led to better governance and more confidence from the market. Nevertheless, there is still no definitive proof. When female representation is superficial or not completely integrated into an inclusive governance framework, gender diversity does not necessarily lead to increased firm value in certain contexts (Garanina & Muravyev, 2021; Simionescu et al., 2021). Given these contradictory results, it's more probable that green financing and gender diversity on boards will have conditional rather than universal market effects.

In order to clarify these connections, this research makes use of Stakeholder Theory, Signalling Theory, and Agency Theory. According to Stakeholder Theory, firms can better meet the expectations of a wider range of stakeholders and increase their legitimacy through environmentally responsible financing. On the other hand, according to Signalling Theory, gender-diverse boards and green financing are visible signs of excellent strategy, dedication to sustainability, and proactive leadership (Qureshi et al., 2020; Hoang et al., 2026; Kyaw et al., 2025). The importance of governance procedures in minimising opportunism and information asymmetry is further highlighted by Agency Theory. According to Chen and Kao (2022) and Li et al. (2022), a diverse board could lead to better monitoring and higher firm value. Athayya and Yulazri (2025) and Sulbahri et al. (2023) point out that market valuation is highly dependent on views of financial robustness, governance quality, and future development possibilities, making Price-to-Book Value (PBV) a particularly relevant proxy for firm value in this study. This is especially true for banks.

Prior banking studies have generally examined sustainable finance, governance, and prudential strength through separate analytical streams. Research on green finance and green banking disclosure primarily investigates whether sustainability-oriented activities directly

improve PBV, Tobin's Q, financial performance, or environmental outcomes (Baharudin & Arifin, 2023; Purwanti, 2024; Puspitasari & Firmansyah, 2025). Studies on board gender diversity predominantly focus on its direct association with firm value or its role in strengthening corporate social responsibility and ESG outcomes (Qureshi et al., 2020; Li et al., 2022; Brinette et al., 2023). Meanwhile, banking studies generally treat capital adequacy as a direct determinant of performance and market valuation or as a moderator of conventional board characteristics (Ikhsan et al., 2022; Jagirani et al., 2023; Naibaho et al., 2024). Consequently, limited attention has been paid to whether prudential strength changes the market valuation of two conceptually different signals: a sustainability-oriented resource-allocation signal represented by green financing and a governance-quality signal represented by board gender diversity.

This study addresses this gap by conceptualising the Capital Adequacy Ratio (CAR) as a financial-capacity boundary condition rather than merely as a conventional bank-performance indicator. Although green financing and board gender diversity may signal long-term orientation, stakeholder responsiveness, and governance quality, investors may not value these signals independently of a bank's capacity to absorb risks and support their implementation. CAR therefore provides a theoretically relevant mechanism through which the credibility and value relevance of sustainability and governance signals may be strengthened or diminished. This perspective is particularly important for Indonesian listed banks during the 2021–2024 post-pandemic period, when banks simultaneously faced economic recovery pressures, increasingly formalised sustainable-finance expectations, and continuing prudential-capital requirements. By examining PBV as the primary market-based valuation measure and Tobin's Q as a robustness measure, this study contributes to the literature by explaining not only whether green financing and board gender diversity matter for firm value, but also when and under what financial-capacity conditions their market effects become more or less valuable. In doing so, the study reveals a potential tension between sustainability signalling and prudential strength that has received limited attention in emerging-market banking research.

2. Literature Review & Hypothesis Development

In order to understand how capital sufficiency, gender diversity on boards, and green financing affect banking firm value, this study takes a multi-theoretical approach. No one theory adequately describes the evolution of bank valuations due to the high levels of regulatory pressure, market scrutiny, and stakeholder expectations. Qureshi et al. (2020) and Liu and Wu (2023) found that firm value may be explained by external legitimacy, information signals, and internal governance discipline. To that end, this study blends Stakeholder Theory, Signalling Theory, and Agency Theory.

2.1 Stakeholder Theory

Green financing shows that banks are listening to the calls for more sustainable intermediation from regulators, investors, and society as a whole. Responding in this way can boost credibility, positioning, and value for the firm in the long run, especially if sustainability pledges are seen as real and not just lip service (Jiang et al., 2022; Dai et al., 2025). A more diverse board may be more attuned to the needs of a wider range of stakeholders and more adept at CSR-oriented governance; this, in turn, can increase the value relevance of sustainability-related efforts, which is why gender diversity on boards is also rational (Gaio & Gonçalves, 2022; Li et al., 2022).

2.2 Signalling Theory

According to Signalling Theory, capital market information asymmetry can be mitigated by visible company actions. Here, green financing could mean being prepared strategically, being aware of climate risk, and in line with changing ESG expectations; gender diversity on boards could mean better governance, more independence, and more organisational adaptability (Hoang et al., 2026; Elarabi & Khalifa, 2025; Altinyay et al., 2025; Nguyen et al., 2023). The perceived substantiveness, as opposed to symbolicity, of female representation may determine the signalling value of diversity, which is not consistently the case (Brinette et al., 2023; Garanina & Muravyev, 2021). Mounta et al. (2025) and Githiaka et al. (2025) found that banks with higher capital adequacy rates had better market valuations, which is a reflection of their resilience, regulatory strength, and reduced bankruptcy risk. Therefore, CAR also has signalling value in the banking industry.

2.3 Agency Theory

According to Agency Theory, checks and balances provide a cap on managerial avarice and recklessness. Under the right governance circumstances, gender diversity on boards may improve monitoring quality, decrease groupthink, and increase board discourse, all of which contribute to a decrease in agency costs and an increase in firm value (Chen & Kao, 2022; Lawrence & Raithatha, 2023). From an agency viewpoint, CAR is also important since it limits managerial freedom and makes sure that strategy decisions are in line with long-term financial stability through tighter capital discipline. Therefore, previous research indicates that capital adequacy has a direct impact on business value and might potentially enhance the efficacy of governance systems in financial institutions (Jagirani et al., 2023; Naibaho et al., 2024; Sulbahri et al., 2023; Athayya & Yulazri, 2025).

2.4 Theoretical Integration

Integrating these theories suggests that the effects of green financing and board gender diversity on bank value are not necessarily universal. Stakeholder Theory explains how sustainability and inclusive governance may improve legitimacy, while Signalling Theory emphasises how investors interpret these attributes as indicators of strategic quality. Agency Theory further explains how governance mechanisms may reduce managerial opportunism and information asymmetry. However, these theories also allow competing predictions. Sustainability and diversity signals may lose their value when they provide little additional information, are perceived as symbolic, or are not supported by sufficient organisational capacity. Similarly, strong capital adequacy may either increase the credibility of these signals or reduce their marginal informational value because the bank is already perceived as financially resilient. This integrated framework therefore treats CAR as a boundary condition that may strengthen or weaken the market valuation of sustainability and governance attributes rather than assuming an automatically reinforcing effect.

2.5 Green Financing and Firm Value

The level to which financial institutions invest in ecologically friendly endeavours is captured by green financing. According to stakeholder theory, this type of funding can boost market trust by bringing banks in line with regulatory, investor, and society expectations. According to previous research, corporate value and market positioning can be enhanced through green-oriented strategies, green credit, and sustainable finance disclosure (Jiang et al., 2022; Lai et al., 2022; Purwanti, 2024; Puspitasari & Firmansyah, 2025). According to Signalling Theory, investors may assign a greater valuation to companies that demonstrate strategic agility, environmental consciousness, and a focus on the long term (Hoang et al., 2026; Li & Lin, 2024).

The reputational and strategic benefits of green financing are expected to exceed the costs of monitoring and extended payback periods, according to theory. However, these factors may vary depending on the circumstances (Baharudin & Arifin, 2023; Tengfei & Ullah, 2024; Wang, 2025). That is why we postulate the following theory based on our research:

H1: Green financing has a positive effect on firm value.

2.6 Board Gender Diversity and Firm Value

Board gender diversity may improve governance quality by introducing broader perspectives, strengthening board deliberation, and reducing groupthink (Grau & Bel, 2022; Nepal et al., 2025). From an Agency Theory perspective, the participation of female directors may strengthen monitoring and constrain opportunistic managerial behaviour, thereby supporting long-term value creation (Chatterjee & Nag, 2022; Chen & Kao, 2022; Lawrence & Raithatha, 2023). Stakeholder Theory and Signalling Theory similarly suggest that the presence of women on the Board of Directors may demonstrate responsiveness to social expectations and inclusive governance practices, potentially improving market confidence (Gaio & Gonçalves, 2022; Li et al., 2022; Altinyay et al., 2025; Subhani et al., 2024).

Nevertheless, the percentage of female directors captures only the numerical dimension of board gender diversity and may not fully represent the substantive influence of women in governance. Its contribution to firm value may depend on whether female directors reach a sufficient critical mass, hold meaningful executive authority, possess relevant expertise, serve on strategic committees, or occupy leadership positions. When female participation is limited, symbolic, or unsupported by decision-making authority, numerical representation may not generate the monitoring and signalling benefits predicted by theory (Garanina & Muravyev, 2021; Brinette et al., 2023; Simionescu et al., 2021). Within the narrower numerical representation measured in this study, a higher proportion of female directors is nevertheless expected to be positively associated with firm value. Therefore, the following hypothesis is proposed:

H2: Board gender diversity has a positive effect on firm value.

2.7 Capital Adequacy Ratio and Firm Value

A bank's capacity to weather losses and keep its finances stable in the face of risk is demonstrated by its Capital Adequacy Ratio (CAR). Ogunode et al. (2022) found that banks with better capital holdings were more favourably perceived due to the fact that they demonstrated prudential soundness and were less vulnerable to distress. A high CAR can limit managers' risk-taking and help create value in the long run, according to Signalling Theory, and it also indicates resilience and careful risk management, according to Agency Theory. Mounta et al. (2025), Githiaka et al. (2025), Athayya & Yulazri (2025), Bhattarai (2021), Naibaho et al. (2024), and Sulbahri et al. (2023) are all in agreement that stronger capital adequacy is linked to higher market value and better business results. Firm value is anticipated to be positively impacted by CAR. Consequently, the following theory is put forth by this study:

H3: Capital Adequacy Ratio has a positive effect on firm value.

2.8 The Moderating Role of Capital Adequacy Ratio in the Relationship between Green Financing and Firm Value

The value relevance of green financing may depend on a bank's financial capacity to absorb risk and sustain long-term financing commitments. From a Signalling Theory perspective, strong capital adequacy can increase the credibility of green financing because well-capitalised banks are better positioned to bear longer investment horizons, implementation uncertainty,

and monitoring costs. Investors may therefore interpret green financing undertaken by financially resilient banks as a substantive strategic commitment rather than a symbolic sustainability initiative. This argument is consistent with evidence that sustainability outcomes are more likely to be valued when supported by strong financial and institutional capacity (Dai et al., 2025; Wang, 2025; Mouna et al., 2025; Naibaho et al., 2024).

However, an alternative signalling argument suggests that CAR may weaken, rather than strengthen, the marginal value of green financing. When a bank is already highly capitalised and perceived as financially safe, additional green financing may provide limited new information regarding its resilience or long-term orientation. Investors may also view further allocations to green financing as a conservative use of excess capital, particularly when green projects are associated with longer payback periods, uncertain returns, or lower yields than conventional lending. Accordingly, prudential strength may substitute for, rather than complement, the positive signal conveyed by green financing. Nevertheless, because strong capital adequacy is expected to increase the bank's capacity to implement and sustain green financing credibly, this study predicts a strengthening effect. Therefore, the following hypothesis is proposed:

H4: Capital Adequacy Ratio strengthens the positive effect of green financing on firm value.

2.9 The Moderating Role of Capital Adequacy Ratio in the Relationship between Board Gender Diversity and Firm Value

Capital adequacy may also determine whether board gender diversity is perceived as a value-relevant governance mechanism. From an Agency Theory perspective, a strong capital position provides a stable prudential environment in which a gender-diverse board can more effectively perform its monitoring and strategic functions. Capital discipline may constrain excessive managerial risk-taking, while diverse perspectives may improve the quality of oversight and long-term decisions. Signalling Theory similarly suggests that the combination of gender diversity and high capital adequacy may convey governance maturity, organisational resilience, and the capacity to implement strategic decisions (Jagirani et al., 2023; Kyaw et al., 2025; Nguyen et al., 2023).

A competing argument is that stringent capital requirements may restrict managerial and board discretion, thereby reducing the incremental contribution of board gender diversity. In highly regulated and strongly capitalised banks, strategic decisions may already be shaped by prudential requirements, risk-management systems, and regulatory supervision. Moreover, a higher numerical proportion of female directors may provide limited additional information when female directors do not possess sufficient authority, experience, committee involvement, or leadership responsibility. Nevertheless, this study expects financial stability and capital discipline to provide a supportive environment in which the monitoring and signalling benefits associated with numerical board gender diversity become more credible. Therefore, the following hypothesis is proposed:

H5: Capital Adequacy Ratio strengthens the positive effect of board gender diversity on firm value.

3. Methodology

This study uses a quantitative explanatory approach to look at how green financing, gender diversity on boards, and the Capital Adequacy Ratio (CAR) affect firm value in listed banks in Indonesia. A total of 188 firm-year observations were obtained from the sample, which includes 47 banking firms that were listed on the Indonesia Stock Exchange from 2021 to 2024.

Banks that were regularly listed, released full financial statements and yearly reports, and revealed all necessary data for all variables were included in the study using purposive sampling. Primary sources for the data used in this study include the IDX's and the banks' publicly available corporate disclosures, audited annual reports, financial statements, and sustainability reports.

Although the study employs an explanatory panel-data design, the estimated coefficients are interpreted as conditional associations rather than definitive causal effects. This distinction is important because firm value, green financing, board composition, and capital adequacy may be jointly determined. For example, banks with higher market valuations may possess greater financial and organisational capacity to expand green financing, maintain larger capital buffers, or implement changes in board composition. Accordingly, the empirical design controls for time-invariant bank characteristics through bank fixed effects and includes profitability, asset quality, and bank size as observable controls, but it does not claim to eliminate all potential sources of simultaneity or reverse causality.

Green financing (GF) is derived from the total financing or credit allocated to Sustainable Business Activities (Kegiatan Usaha Berkelanjutan or KUB), as disclosed in each bank's annual report or sustainability report. Green financing (GF) is derived from the total financing or credit allocated to Sustainable Business Activities (Kegiatan Usaha Berkelanjutan or KUB), as disclosed in each bank's annual report or sustainability report. To ensure that zero and positive observations are measured on a consistent mathematical scale, GF is calculated as the natural logarithm of one plus the total KUB financing stated in Indonesian rupiah: $GF = \ln(1 + \text{total KUB financing})$. Under this transformation, a bank-year observation with no KUB financing has a GF value of $\ln(1 + 0) = 0$, while all positive financing amounts are transformed using the same formula. The transformation retains zero observations, reduces the skewness of the financing data, and avoids the discontinuity created by applying the logarithm only to positive observations. Total KUB financing is used to represent the absolute financial resources committed by each bank to sustainable activities, while differences in bank scale are controlled through SIZE, measured as the natural logarithm of total assets.

Board Gender Diversity (BGD) is operationalised as the percentage of female members on the Board of Directors, calculated by dividing the number of female directors by the total number of directors and multiplying the result by 100%. Consistent with Indonesia's two-tier governance structure, this measurement refers exclusively to the Board of Directors and excludes the Board of Commissioners. In this study, BGD captures only the numerical representation dimension of gender diversity. It does not directly measure the substantive influence of female directors through executive authority, tenure, independence, professional expertise, committee membership, leadership positions, or participation in strategic decision-making. Accordingly, the findings are interpreted specifically in relation to the proportion of female directors rather than as a comprehensive assessment of gender diversity in corporate governance.

CAR is calculated as the percentage of regulatory capital to risk-weighted assets. Price-to-Book Value (PBV) is used as a proxy for firm value. Some of the control variables mentioned include ROA, NPL, and SIZE, which stand for firm size. In Table 1 we can see a summary of the operational definitions and measurements.

Table 1. Measurement of Variables

Variable	Operational Definition	Measurement
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Firm Value (PBV)	Market value of the firm relative to its book value	Market Price per Share / Book Value per Share
Green Financing (GF)	Total financing or credit allocated to Sustainable Business Activities (KUB)	Ln (1 + total KUB financing in Indonesian rupiah)
Board Gender Diversity (BGD)	Numerical gender representation on the Board of Directors, proxied by the proportion of female directors and excluding the Board of Commissioners	(Number of Female Directors ÷ Total Number of Directors) × 100%
Capital Adequacy Ratio (CAR)	Bank's capital adequacy to absorb risk	(Capital / Risk-Weighted Assets) × 100%
Profitability (ROA)	Bank's ability to generate profit from total assets	(Net Income / Total Assets) × 100%
Asset Quality (NPL)	Credit risk measured by non-performing loans	(Non-Performing Loans / Total Loans) × 100%
Firm Size (SIZE)	Scale of the bank's operations	Natural logarithm of total assets

Note: BGD captures the numerical representation of female directors and does not measure their authority, tenure, independence, expertise, committee membership, leadership position, or substantive influence over board decisions.

To test the hypotheses, this study estimates the following panel regression model:

$$PBV_{it} = \alpha + \beta_1 GF_{it} + \beta_2 BGD_{it} + \beta_3 CAR_{it} + \beta_4 (GF_{it} * CAR_{it}) + \beta_5 (BGD_{it} * CAR_{it}) + \beta_6 ROA_{it} + \beta_7 NPL_{it} + \beta_8 SIZE_{it} + \varepsilon_{it}$$

where:

PBV_{it}	= firm value of bank i in year t
GF_{it}	= green financing of bank i in year t
BGD_{it}	= board gender diversity of bank i in year t
CAR_{it}	= capital adequacy ratio of bank i in year t
$GF_{it} * CAR_{it}$	= interaction between green financing and capital adequacy ratio
$BGD_{it} * CAR_{it}$	= interaction between board gender diversity and capital adequacy ratio
ROA_{it}	= profitability of bank i in year t
NPL_{it}	= asset quality of bank i in year t
$SIZE_{it}$	= firm size of bank i in year t
α	= constant
ε_{it}	= error term

The empirical analysis was conducted in several stages. First, descriptive statistics were used to examine the distribution of the variables, while Pearson correlations provided an initial

assessment of their relationships and potential multicollinearity. Second, the appropriate panel-data estimator was selected using the Chow, Hausman, and Lagrange Multiplier tests. The Chow and Hausman test results supported the Fixed Effect Model (FEM), indicating the presence of unobserved bank-specific characteristics that were correlated with the explanatory variables. Bank fixed effects were therefore used to control for time-invariant heterogeneity across the 47 sampled banks, including persistent differences in business models, governance structures, ownership characteristics, and market positioning. The baseline specification includes bank fixed effects to control for time-invariant heterogeneity across the sampled banks. However, the 2021–2024 observation period may also contain common year-specific shocks associated with post-pandemic recovery, interest-rate and inflation movements, regulatory developments, sustainable-finance implementation, and capital-market conditions. Therefore, an additional two-way fixed-effects model incorporating both bank and year fixed effects is estimated as a robustness test. The year fixed effects capture common temporal shocks affecting all sampled banks in a particular year, while the bank fixed effects control for persistent unobserved differences across banks. The year 2021 is used as the reference period. The two-way fixed-effects model is estimated using cross-section weighting to maintain comparability with the baseline weighted fixed-effects specification. The stability of the main coefficients and interaction terms across the two specifications is used to assess whether the findings are sensitive to common year-specific shocks.

Including a full set of year indicators in addition to 47 bank fixed effects would further reduce the limited within-panel degrees of freedom and could absorb much of the common temporal variation relevant to the study's institutional setting. Nevertheless, the absence of year fixed effects means that the model may not fully separate the estimated associations from macroeconomic, regulatory, or market-wide shocks occurring between 2021 and 2024. The results should therefore be interpreted with this qualification.

Third, the hypotheses were evaluated using the estimated coefficients, t-statistics, and probability values, while R-squared and adjusted R-squared were reported to assess model fit. Finally, the model was re-estimated using Tobin's Q as an alternative market-based measure of firm value. The consistency of the coefficient directions and statistical significance across PBV and Tobin's Q provides evidence that the main results are not specific to a single firm-value proxy. However, this robustness check does not entirely eliminate concerns regarding reverse causality, omitted time-varying factors, or the influence of extreme observations. As an additional robustness assessment, the baseline model was re-estimated by simultaneously including bank and year fixed effects. This specification controls for unobserved bank-specific heterogeneity and common annual shocks that may affect PBV, green financing, capital adequacy, and board gender diversity. The robustness assessment focuses on whether the directions and statistical significance of GF, BGD, CAR, GF×CAR, and BGD×CAR remain consistent after year effects are introduced.

To examine whether the estimation results were disproportionately influenced by extreme observations, additional sensitivity analyses were conducted. First, PBV and CAR were winsorized at the 1st and 99th percentiles. The lower and upper winsorization thresholds were 0.3515 and 29.4780 for PBV and 11.0845% and 212.6531% for CAR, respectively. The interaction variables were subsequently recalculated using the winsorized CAR values, and the two-way fixed-effects model was re-estimated using the same specification as the main model. Second, influential observations were evaluated using Cook's distance, leverage statistics, and

studentized residuals. The diagnostic thresholds were Cook's distance greater than $4/n$, leverage greater than $2k/n$, and an absolute studentized residual greater than 2.

4. Result and Discussion

Listed on the Indonesia Stock Exchange from 2021 to 2024, 47 different banking companies are described here along with the study's factors. Prior to diving into regression analysis, descriptive statistics give a bird's-eye view of the data's distribution and variability. Table 2 displays the summary statistics, which include the minimum, maximum, mean, and standard deviation.

Table 2. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
PBV	188	0.14	63.42	2.4803	6.16513
GF	188	0.00	34.30	25.0085	9.90207
BGD	188	0.00	60.00	16.1019	13.63787
CAR	188	10.50	390.50	42.8742	43.43271
ROA	188	-14.75	11.43	0.8976	3.16466
NPL	188	0.00	4.91	1.1962	1.09890
SIZE	188	28.41	35.43	31.5184	1.66962

The market values listed Indonesian banks above their book value on average, as seen in Table 2, where the dependent variable, firm value (PBV), has a mean of 2.4803. The significant standard deviation, however, indicates that there is a great deal of variety in the market value of different companies. The sampled banks display substantial variation in the scale of environmentally oriented financing. GF ranges from 0.00 to 34.30, with a mean of 25.0085 and a standard deviation of 9.9021. The minimum GF value of 0.00 indicates that some sampled banks did not allocate financing to KUB in particular years. Under the $\ln(1 + \text{total KUB financing})$ transformation, an original KUB financing value of zero is transformed into $\ln(1) = 0$. Therefore, zero and positive observations remain on the same mathematical scale. The wide range of GF reflects substantial differences in banks' participation in and financial commitment to sustainable financing activities. The wide range of GF reflects substantial differences in banks' participation in and scale of sustainable financing activities. BGD ranges from 0.00% to 60.00%, with a mean of 16.1019%, indicating that female directors account for a relatively limited proportion of the Board of Directors in the average sampled bank. A value of 0.00% indicates that the corresponding bank-year had no female member on the Board of Directors. These statistics describe numerical representation only and do not indicate the authority, expertise, tenure, or substantive governance influence of the female directors concerned. With a mean Capital Adequacy Ratio (CAR) of 42.8742, the banks that were part of the sample often have capital levels that are much higher than what is required by law. The large variation in CAR levels also indicates that banks' capital strength varies significantly. There is also fluctuation in the control variables across data. Results for ROA, NPL, and SIZE are on average 0.8976, 1.1962, and 31.5184, respectively. All things considered, there is enough variation between time periods and among sections to warrant additional panel regression analysis, according to these figures.

The influence diagnostics further identified 19 observations with Cook's distance exceeding the $4/n$ threshold of 0.0213, 12 observations with absolute studentized residuals greater than 2, and two observations with leverage exceeding the $2k/n$ threshold of 0.6170. The most

influential observation was BANK in 2021, which recorded a CAR of 390.50%, followed by BBHI in 2021, which recorded the maximum PBV of 63.42. These diagnostics confirm that a limited number of unusual bank-year observations exert considerable influence on the estimated coefficients. Nevertheless, these observations were retained in the main analysis because they represent reported bank conditions rather than verified data-entry errors.

To check for multicollinearity and analyse bivariate correlations among the key variables, we do a correlation analysis before we estimate the panel regression model. Table 3 displayed the Pearson correlation matrix.

Table 3. Pearson Correlation

	PBV	GF	BGD	CAR
PBV	1.0000	-0.2306	-0.0769	0.4376
GF	-0.2306	1.0000	0.2174	-0.3044
BGD	-0.0769	0.2174	1.0000	0.0314
CAR	0.4376	-0.3044	0.0314	1.0000

The highest positive bivariate correlation between CAR and firm value (PBV) is 0.4376, as shown in Table 3. The bivariate correlations between PBV and GF and BGD are weakly negative, on the other hand. Because the panel regression model accounts for firm-specific traits and interaction effects in its analysis, these preliminary findings may not be reflective of the multivariate relationships found there. It is worth noting that none of the independent variables have pairwise correlations that are higher than 0.80, which indicates that severe multicollinearity is probably not a big deal in the baseline model. This means that the variables can go on to panel regression analysis.

Finding the best estimating model is the next stage as panel data is used in this investigation. The Chow test first compares the Common Effect Model (CEM) with the Fixed Effect Model (FEM) as part of the model selection phase. This data is shown in Table 4.

Table 4. Chow Test Result

Effects Test	Statistic	d.f	Prob.
Cross-section F	3.331852	(46,132)	0.0000
Cross-section Chi-Square	144.105448	46	0.0000

A probability value of 0.0000 was obtained from the Cross-section Chi-Square test, as indicated in Table 4. This result is lower than the 5% significance limit. Based on these findings, it seems that the Fixed Effect Model outperforms the Common Effect Model. So, to find out if the Fixed Effect Model or the Random Effect Model is better, the analysis goes to the Hausman test.

Table 5. Hausman Test Result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross-section random	63.693159	8	0.0000

Table 5 shows that the probability value of the Hausman test is 0.0000, which is likewise less than the 5% significance limit. This finding suggests that, compared to the Random Effect Model, the Fixed Effect Model is the better choice. The Fixed Effect Model is chosen as the final estimating model for hypothesis testing because it regularly receives positive results from both the Chow and Hausman tests. As a result, this study does not include the Lagrange Multiplier (LM) test, which is commonly used to compare the Common Effect Model (CEM) and the Random Effect Model (REM). The choice of FEM is adequately justified once the Chow test shows that it is better than CEM and the Hausman test shows that it is better than REM. So, running the LM test wouldn't change the choice of model in the end. Testing hypotheses

follows the Fixed Effect Model selection. The regression findings, including the standard errors, t-statistics, probability values, and coefficients are reported in Table 6.

Table 6. Hypothesis Test Results

The selected model = FEM, Dependent Variable = PBV				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	146.4141	30.2233	4.8444	0.0000
GF	0.0903	0.0305	2.9590	0.0037
BGD	-0.0840	0.0219	-3.8305	0.0002
CAR	0.0348	0.0115	3.0315	0.0029
GF*CAR	-0.0026	0.0005	-5.6277	0.0000
BGD*CAR	0.0014	0.0005	2.8509	0.0051
ROA	-0.0875	0.0543	-1.6118	0.1094
NPL	-0.1375	0.1846	-0.7445	0.4579
SIZE	-4.5865	0.9609	-4.7733	0.0000
R-squared	0.7282			
Adjusted R-squared	0.6171			

Table 6 shows that GF has a positive coefficient ($\beta = 0.0903$; $p = 0.0037$), BGD has a negative coefficient ($\beta = -0.0840$; $p = 0.0002$), and CAR has a positive coefficient ($\beta = 0.0348$; $p = 0.0029$). However, because GF and BGD interact with CAR, these lower-order coefficients represent conditional associations when the interacting variable equals zero and should not be interpreted as unconditional average effects. The statistically significant GF×CAR coefficient is negative ($\beta = -0.0026$; $p < 0.001$), indicating that the marginal association between green financing and PBV declines as CAR increases. Thus, H4 is not supported. Conversely, the BGD×CAR coefficient is positive and statistically significant ($\beta = 0.0014$; $p = 0.0051$), indicating that stronger capital adequacy makes the association between gender diversity on the Board of Directors and PBV progressively more favourable. This interaction direction supports H5, although it does not imply that the BGD–PBV association is positive at every level of CAR. Since the probability values of ROA and NPL surpass the 5% significance level, we may conclude that these control variables do not have a statistically significant impact on firm value. Even after accounting for all other model factors, the larger banks in the sample tended to have lower market valuation, as indicated by the negative and statistically significant coefficient ($\beta = -4.5865$; $p = 0.0000$) for SIZE. An R-squared value of 0.7282 and an adjusted R-squared value of 0.6171 are reported by the model, indicating its explanatory power. This indicates that controls, interaction terms, and independent variables all work together to explain a large chunk of the variance in firm value among the banks in the sample.

Table 7. Conditional Marginal Effects of Green Financing and Board Gender Diversity

Predictor	CAR level	CAR value	Marginal effect	Std. Error	t-Statistic	Probability	95% Confidence Interval
Green Financing	Low	10.5000	0.0521	0.0288	1.8070	0.0731	[-0.0049; 0.1091]
Green Financing	Mean	42.8700	-0.0390	0.0258	-1.5139	0.1325	[-0.0900; 0.0120]
Green Financing	High	86.3100	-0.1613	0.0355	-4.5408	0.0000	[-0.2315; -0.0910]

Board Gender Diversity	Low	10.5000	-0.0397	0.0153	-2.5975	0.0105	[-0.0700; -0.0095]
Board Gender Diversity	Mean	42.8700	-0.0026	0.0129	-0.2012	0.8409	[-0.0281; 0.0229]
Board Gender Diversity	High	86.3100	0.0472	0.0318	1.4875	0.1393	[-0.0156; 0.1101]

Note: Low CAR represents the minimum observed CAR of 10.50%, mean CAR represents the sample average of 42.87%, and high CAR represents one standard deviation above the mean, or 86.31%. Conditional effects are calculated using mean-centered variables. Statistical significance is determined using two-tailed tests and 95% confidence intervals.

Table 7 reports the formal significance tests of the conditional marginal effects. At the low CAR level of 10.50%, the marginal effect of Green Financing is positive but statistically insignificant at the 5% level ($\beta = 0.0521$; $p = 0.0731$). At the mean CAR level of 42.87%, the effect becomes negative but remains statistically insignificant ($\beta = -0.0390$; $p = 0.1325$). At the high CAR level of 86.31%, however, Green Financing has a negative and statistically significant effect on PBV ($\beta = -0.1613$; $p < 0.001$). Its 95% confidence interval does not include zero. These results indicate that the negative moderation effect of CAR becomes economically and statistically meaningful only when banks maintain relatively high capital adequacy.

For Board Gender Diversity, the conditional effect is negative and statistically significant when CAR is at its low level ($\beta = -0.0397$; $p = 0.0105$). At the mean CAR level, the effect is close to zero and statistically insignificant ($\beta = -0.0026$; $p = 0.8409$). At the high CAR level, the coefficient becomes positive but remains statistically insignificant ($\beta = 0.0472$; $p = 0.1393$). Therefore, the positive BGD-CAR interaction should not be interpreted as meaning that Board Gender Diversity has a statistically significant positive effect at all relatively high CAR levels. Instead, the interaction indicates that the marginal effect of Board Gender Diversity becomes progressively more positive as CAR increases.

To assess whether the main conclusions depend on the measurement of firm value, the model was re-estimated using Tobin's Q as an alternative dependent variable. As shown in Table 8, the robustness model produces coefficient directions and significance patterns consistent with the PBV-based estimation. Green financing and CAR remain positively associated with firm value, whereas board gender diversity remains negatively associated with firm value. The interaction between GF and CAR remains negative, while the interaction between BGD and CAR remains positive. These results indicate that the main findings are not solely attributable to the use of PBV as the dependent variable.

Table 8. Robustness Test Result

The selected model = FEM, Dependent Variable = Tobins Q				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.7321	8.2570	3.6008	0.0004
GF	0.0095	0.0046	2.0790	0.0390
BGD	-0.0169	0.0063	-2.6724	0.0085
CAR	0.0153	0.0032	4.7054	0.0000
GF*CAR	-0.0004	0.0002	-2.0817	0.0388
BGD*CAR	0.0004	0.0002	2.7685	0.0062

ROA	-0.0197	0.0185	-1.0654	0.2886
NPL	-0.0188	0.0529	-0.3558	0.7226
SIZE	-0.9142	0.2630	-3.4757	0.0007
R-squared	0.7094			
Adjusted R-squared	0.5905			

Table 8 shows that when looking at several ways to estimate firm value, a number of important findings hold up. The following effects have persisted: CAR's positive and statistically significant effect, GF's positive and statistically significant effect, BGD's negative and statistically significant effect, GF's negative and statistically significant interaction with CAR, BGD's positive and statistically significant interaction with CAR, and SIZE's negative and statistically significant effect. It appears from these findings that the capital adequacy, green financing, moderating effects, and firm size baseline conclusions hold up when Tobin's Q is applied. In sum, the robustness test lends credence to the primary conclusions by demonstrating that, when tested using a different market-based measure of firm value, the important variables' directions and significance levels are unaffected.

Table 9. Two-Way Fixed-Effects Robustness Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	61.9032	33.3498	1.8562	0.0657
GF	0.0817	0.0316	2.5848	0.0108
BGD	-0.0518	0.0196	-2.6440	0.0092
CAR	0.0494	0.0121	4.0683	0.0001
GF*CAR	-0.0028	0.0005	-5.6349	0.0000
BGD*CAR	0.0011	0.0005	2.1553	0.0330
ROA	-0.1454	0.0651	-2.2322	0.0273
NPL	-0.1382	0.1434	-0.9637	0.3370
SIZE	-1.9060	1.1051	-1.7247	0.0870
R-squared	0.8069			
Adjusted R-squared	0.7222			

Table 9 presents the results of the two-way fixed-effects robustness test, which simultaneously controls for unobserved bank-specific heterogeneity and common year-specific shocks. After including year fixed effects, GF remains positively and significantly associated with PBV ($\beta = 0.0817$; $p = 0.0108$), while the lower-order coefficient of BGD remains negative and statistically significant ($\beta = -0.0518$; $p = 0.0092$). CAR also retains a positive and significant coefficient ($\beta = 0.0494$; $p < 0.001$). Thus, the directions and statistical significance of the three principal explanatory variables remain consistent with the baseline findings.

More importantly, the two interaction effects remain stable. The GF×CAR coefficient remains negative and statistically significant ($\beta = -0.0028$; $p < 0.001$), confirming that stronger capital adequacy reduces the marginal association between green financing and firm value. Conversely, the BGD×CAR coefficient remains positive and statistically significant ($\beta = 0.0011$; $p = 0.0330$), indicating that the association between board gender diversity and firm value becomes progressively more favourable as capital adequacy increases. Therefore, the central moderation findings are not driven solely by common annual shocks during the 2021–2024 period.

Among the control variables, ROA becomes negatively significant after year effects are included ($\beta = -0.1454$; $p = 0.0273$), while NPL remains statistically insignificant ($\beta = -0.1382$; $p = 0.3370$). SIZE retains its negative direction but is no longer significant at the 5% level ($\beta = -$

1.9060; $p = 0.0870$). This change suggests that part of the previously significant size association may reflect common temporal conditions affecting the market valuation of Indonesian banks. Accordingly, the negative SIZE finding should be interpreted more cautiously than the principal explanatory and interaction effects.

The year fixed effects show that the 2022 coefficient is negative and significant relative to 2021 ($\beta = -0.3192$; $p = 0.0446$), whereas the coefficients for 2023 and 2024 are not statistically significant. A joint test of the three year effects produces an F-statistic of 1.4078 with a probability of 0.2435, indicating that the year effects are not jointly significant. Nevertheless, including year fixed effects increases the model's R-squared from 0.7282 in the original specification to 0.8069 and leaves the main coefficients and interaction effects stable. These results provide additional confidence that the central findings are not merely attributable to post-pandemic recovery, regulatory developments, sustainable-finance implementation, or capital-market movements shared by all banks.

Table 10. Year Effect results

Year	Coefficient	Std. Error	t-Statistic	Probability
2022	-0.3192	0.1574	-2.0283	0.0446
2023	-0.2372	0.1903	-1.2462	0.2149
2024	-0.2093	0.2552	-0.8202	0.4136

Table 10 presents the estimated year effects, using 2021 as the reference year. The coefficient for 2022 is negative and statistically significant ($\beta = -0.3192$; $p = 0.0446$), indicating that, after controlling for bank-specific characteristics and the other variables in the model, PBV was lower in 2022 than in 2021. This result may reflect common market conditions during the early post-pandemic adjustment period, including changes in interest rates, investor expectations, sustainable-finance implementation, and banking-sector risk perceptions.

The coefficients for 2023 ($\beta = -0.2372$; $p = 0.2149$) and 2024 ($\beta = -0.2093$; $p = 0.4136$) are also negative but statistically insignificant. Therefore, the average PBV in 2023 and 2024 was not significantly different from that in 2021 after controlling for bank fixed effects and the explanatory variables. Overall, the results indicate that the most apparent common annual decline in market valuation occurred in 2022, while the year-specific differences weakened in 2023 and 2024. Nevertheless, the year effects should be interpreted primarily as controls for common temporal shocks rather than as the main explanatory variables of the study.

Table 11. Outlier Robustness Test Using 1% and 99% Winsorization

Variable	Baseline coefficient	Baseline probability	Winsorized coefficient	Winsorized probability
Green Financing	0.0817	0.0108	0.0152	0.4460
Board Gender Diversity	-0.0518	0.0092	-0.0170	0.2506
Capital Adequacy Ratio	0.0494	0.0001	0.0085	0.4817
Green Financing $\times$ CAR	-0.0028	0.0000	-0.0006	0.1774
Board Gender Diversity $\times$ CAR	0.0011	0.0330	0.0000	0.9858
Return on Assets	-0.1454	0.0273	-0.1694	0.0004

Non-Performing Loans	-0.1382	0.3370	-0.0347	0.7010
Firm Size	-1.9060	0.0870	-2.2744	0.0017

Note: PBV and CAR are winsorized at the 1st and 99th percentiles. The interaction terms are recalculated after winsorization. The same two-way fixed-effects specification is used in both estimations.

Table 11 presents the sensitivity of the results to extreme PBV and CAR observations. After winsorization, the signs of Green Financing, Board Gender Diversity, CAR, and the Green Financing–CAR interaction remain consistent with the baseline model. However, their coefficient magnitudes decline substantially and their statistical significance disappears. The Board Gender Diversity–CAR interaction also becomes close to zero and statistically insignificant. These results indicate that the statistical strength of the baseline relationships is sensitive to observations located in the extreme tails of the PBV and CAR distributions. Therefore, the baseline findings should be interpreted cautiously as sample-specific associations rather than conclusive evidence of relationships that apply uniformly across all Indonesian banks.

Table 12. Two-Way Fixed-Effects Results Using Mean-Centered Variables

Variable	Coefficient	Std. Error	t-Statistic	Probability
Constant	63.0030	33.3281	1.8904	0.0609
Centered Green Financing	-0.0390	0.0258	-1.5139	0.1325
Centered Board Gender Diversity	-0.0026	0.0129	-0.2012	0.8409
Centered CAR	-0.0025	0.0109	-0.2312	0.8176
Centered GF × Centered CAR	-0.0028	0.0005	-5.6349	0.0000
Centered BGD × Centered CAR	0.0011	0.0005	2.1553	0.0330
ROA	-0.1454	0.0651	-2.2322	0.0273
NPL	-0.1382	0.1434	-0.9637	0.3370
SIZE	-1.9060	1.1051	-1.7247	0.0870

Note: GF, BGD, and CAR are mean-centered before constructing the interaction terms. Bank and year fixed effects are included in the model.

Table 12 presents the estimation results after mean-centering Green Financing, Board Gender Diversity, and CAR. Following mean-centering, the lower-order coefficients represent the effects of the corresponding variables when the other variables included in the interaction terms are at their sample means. The coefficient of centered Green Financing is negative but statistically insignificant ($\beta = -0.0390$; $p = 0.1325$). Thus, at the average CAR level of 42.8742%, Green Financing does not have a statistically significant direct association with PBV. This result should not be interpreted as the unconditional effect of Green Financing because its relationship with PBV varies according to the level of CAR.

Centered Board Gender Diversity also has a negative and statistically insignificant coefficient ($\beta = -0.0026$; $p = 0.8409$). This indicates that, at the average CAR level, the percentage of female directors does not have a statistically significant direct association with PBV. Similarly, the coefficient of centered CAR is statistically insignificant ($\beta = -0.0025$; $p = 0.8176$). The CAR coefficient represents the association between CAR and PBV when Green Financing and Board Gender Diversity are at their respective sample means.

Importantly, mean-centering does not change the interaction coefficients or their statistical significance. The interaction between centered Green Financing and centered CAR remains

negative and significant ($\beta = -0.0028$; $p < 0.001$), indicating that an increase in CAR weakens the relationship between Green Financing and PBV. Conversely, the interaction between centered Board Gender Diversity and centered CAR remains positive and significant ($\beta = 0.0011$; $p = 0.0330$), suggesting that CAR strengthens the relationship between Board Gender Diversity and PBV. Therefore, the substantive conclusions regarding the moderating role of CAR remain unchanged after mean-centering.

Table 13. Johnson–Neyman Regions of Significance

Predictor	Johnson–Neyman boundary	Conditional-effect interpretation
Green Financing	CAR = 8.39% and 47.37%	Within the observed sample, the effect is significantly negative when CAR exceeds 47.37%
Board Gender Diversity	CAR = 25.58% and 222.66%	The effect is significantly negative when CAR is below 25.58%, insignificant between 25.58% and 222.66%, and significantly positive above 222.66%

Note: The observed CAR range is 10.50%–390.50%. Statistical significance is evaluated at the 5% level.

Table 13 present The Johnson–Neyman analysis provides a more precise identification of the CAR values at which the conditional effects become statistically different from zero. For Green Financing, the Johnson–Neyman boundaries are 8.39% and 47.37%. Because the lower boundary lies below the minimum CAR observed in the sample, the relevant finding is that Green Financing has a statistically significant negative association with PBV when CAR exceeds 47.37%. The effect is not statistically significant between the observed minimum CAR of 10.50% and 47.37%. Approximately 23.9% of the observations are located above this relevant threshold.

For Board Gender Diversity, the Johnson–Neyman boundaries are 25.58% and 222.66%. Its conditional effect is negative and statistically significant when CAR is below 25.58%, but statistically insignificant between 25.58% and 222.66%. The effect becomes significantly positive only when CAR exceeds 222.66%. However, only two bank-year observations, or approximately 1.1% of the sample, fall above the upper threshold. Consequently, the significantly positive BGD effect at extremely high CAR levels should be interpreted with particular caution because it is supported by a very small number of observations and may be related to the extreme CAR values identified in the outlier analysis.

4.1 Green Financing and Firm Value

This study's key finding is that, according to both the baseline and robustness models, green financing significantly and positively affects business value. According to this finding, listed Indonesian banks that prioritise sustainability in their financing are seen by the market as engaging in a valuable strategic activity. Put simply, when there is more involvement in green financing, the market valuation goes up. This indicates that investors see green financing as more than just a greenwashing effort. Previous research has shown that green financing can lead to value-enhancing results, which is in line with our current conclusion. Both Lai et al. (2022) and Jiang et al. (2022) find that green credit boosts business value in sustainability-related sectors. Lai argues that green-oriented initiatives create value by enhancing market perceptions and increasing firms' strategic posture. Green financing and sustainable finance disclosure can boost firm value and financial performance, according to Purwanti (2024),

Puspitasari & Firmansyah (2025), and Li and Lin (2024). Meanwhile, this finding contradicts more cautious perspectives that green financing could come with high expenses, sluggish returns, and benefits that rely on the specific situation (Baharudin & Arifin, 2023; Tengfei & Ullah, 2024; Wang, 2025). While acknowledging that green financing's value effect is not necessarily guaranteed in all contexts, the present analysis lends credence to the more optimistic school of thought in the literature.

Both Stakeholder Theory and Signalling Theory provide useful theoretical frameworks for understanding this outcome. According to Stakeholder Theory, banks can gain legitimacy and support from stakeholders in the long run if they direct their funding toward eco-friendly projects. This is because they will be perceived as more responsive to society, investors, and regulators. According to Signalling Theory, green financing shows that a company is prepared strategically, cares about the environment, and manages its risks for the future. Such financing could indicate that a bank is more flexible in responding to regulatory changes and changing market preferences, which are becoming more important in a banking environment influenced by climate-related pressures and ESG demands. This study suggests that green financing is seen as a market-priced, genuine strategic commitment in the Indonesian banking sector. Accordingly, sustainability-oriented finance may be an integral aspect of a bank's strategy for creating value, rather than just a compliance concern. On a broader scale, the finding adds to the body of knowledge in sustainable finance by demonstrating that, within the framework of banking in emerging markets, green financing may boost firm value provided it is seen as trustworthy, applicable, and in line with the establishment of lasting institutional reforms.

4.2 Board Gender Diversity and Firm Value

The negative lower-order coefficient of BGD should be interpreted in conjunction with the positive BGD×CAR interaction. It does not establish that female directors reduce firm value. Rather, it indicates that the association between the numerical proportion of female directors and market valuation is conditional on capital adequacy. The result does not support H2, which predicts a positive association between BGD and firm value. However, because the operational measure captures only the percentage of female directors, the coefficient cannot be used to evaluate the competence, performance, or individual governance contribution of women directors. Contrarily, it indicates that gender diversity on boards has not yet consistently resulted in value that investors appreciate among the selected Indonesian banks. Several previous research have shown that gender diversity on boards improves business value and governance quality, therefore this finding goes against that. Boards with a mix of men and women can improve firm value and performance, according to studies like Altinyay et al. (2025), Chatterjee and Nag (2022), and Subhani et al. (2024). This new evidence, on the other hand, is in line with previous research that has stressed the context and conditionality of the impact of gender diversity on boards. According to several studies (Garanina & Muravyev, 2021; Simionescu et al., 2021; Brinette et al., 2023; Nguyen et al., 2023), diversity alone will not lead to stronger company outcomes; it must be accompanied by good governance, ESG-related processes, and mature institutions. So, rather than taking a universally good stance on board diversity, this study is more in line with the dependent approach.

This discovery has theoretical implications that are explicable by means of Signalling Theory and Agency Theory. Gender diversity should improve oversight and decrease groupthink, according to Agency Theory. However, if there aren't enough women on boards to make a difference, these gains can be for naught. According to Signalling Theory, if diversity is seen

as symbolic rather than substantial, the market might not see it in a positive light. Thus, the negative coefficient shouldn't be interpreted as proof that women on boards don't add value; rather, it suggests that having representation may not be enough to establish credibility in governance without also incorporating broader organisational inclusion and efficient board processes. As a result, whether gender diversity is institutionally established, operationally meaningful, and linked to actual governance influence rather than relying solely on numerical representation may determine the value relevance of board gender diversity in emerging markets. This finding offers more evidence that deeper governance integration is necessary for Indonesian banks to see an immediate uptick in market valuation, rather than just more female board involvement. Investors' perceptions of board diversity are heavily influenced by contextual factors, which this research adds to the governance literature.

4.3 Capital Adequacy Ratio and Firm Value

Firm value is positively and significantly affected by the Capital Adequacy Ratio, which is the primary conclusion on capital strength. The market's good reception of increased capital adequacy serves as further evidence of the significance of prudential strength for the banking sector. It would suggest that investors in a highly regulated and risk-averse industry view capital sufficiency as a critical measure of stability and profitability. Consistent with other research in the banking industry, this finding supports the hypothesis that capital adequacy increases market value. Capital adequacy adds to firm value either directly or via financial and governance-related pathways, according to Mouna et al. (2025), Githiaka et al. (2025), and Athayya & Yulazri (2025). On the other hand, studies by Naibaho et al. (2024) and Sulbahri et al. (2023) demonstrate that capital adequacy is linked to higher market valuation. Therefore, the current result lends credence to the long-held belief that capital strength is important for both regulatory compliance and the market's evaluation of banks.

Theories of signalling and agency provide explanations for the outcome. According to Signalling Theory, a high CAR indicates a strong ability to tolerate losses, fiscal responsibility, and resilience, which in turn reduces operational uncertainty. Stronger capital discipline, according to Agency Theory, may limit managers' propensity for excessive risk-taking and bring their decisions in line with the goals of long-term stability and value development. In this way, CAR serves as a governance-related tool that boosts investor trust in addition to its prudential ratio role. This suggests that when determining the value of listed banks in Indonesia, market participants give financial resilience a lot of weight. It would suggest that capital strength is a key source of trust in the post-pandemic climate, where stability is particularly important. This discovery shows that prudential measures are still important for valuing firms and that, going forward, sustainability and governance efforts will be evaluated by looking at a bank's financial strength.

4.4 The Moderating Role of CAR in the Relationship between Green Financing and Firm Value

The significantly negative GF–CAR interaction indicates that the marginal valuation effect of Green Financing declines as CAR increases. Nevertheless, the formal conditional-effect analysis shows that this negative relationship is statistically significant only when CAR exceeds 47.37%. One possible explanation is that highly capitalized banks are already perceived as financially secure; therefore, additional Green Financing provides less incremental information to investors. Moreover, investors may perceive a substantial allocation to sustainable financing as involving implementation costs or longer return

horizons when the bank already maintains capital considerably above the regulatory requirement.

In economic terms, GF is measured as $\ln(1 + \text{total KUB financing})$. For banks with positive and sufficiently large KUB financing amounts, a one-unit increase in GF approximately represents a 2.72-fold increase in the underlying financing amount. At low CAR, such an increase corresponds to an estimated 0.0630 increase in PBV. At the mean and high CAR levels, the corresponding estimated PBV changes are -0.0212 and -0.1341 , respectively. These estimates indicate that the marginal valuation benefit of green financing diminishes as prudential capital becomes stronger.

The negative interaction between Green Financing and CAR indicates that the marginal relationship between Green Financing and firm value becomes weaker as CAR increases. However, this finding does not necessarily confirm that CAR substitutes for the sustainability signal provided by Green Financing. Several competing mechanisms may explain the negative interaction, including signalling substitution, overcapitalization, managerial risk aversion, and the short-term profitability consequences of green lending. Because these mechanisms are not directly tested in this study, they should be regarded as alternative theoretical interpretations rather than confirmed causal explanations.

4.5 The Moderating Role of CAR in the Relationship between Board Gender Diversity and Firm Value

The positive BGD–CAR interaction indicates that stronger capital adequacy improves the marginal relationship between Board Gender Diversity and firm value. However, the conditional effect is significantly negative at CAR levels below 25.58%, insignificant across most of the observed CAR range, and significantly positive only above 222.66%. Because very few observations have CAR above this upper threshold, the positive conditional effect should not be generalized to typical listed banks. The result provides only limited evidence that exceptionally strong capitalization may create organizational conditions under which Board Gender Diversity is valued more positively by investors.

This finding should not be interpreted as evidence that female directors reduce firm value at lower levels of CAR. The negative conditional association may reflect limited numerical representation, insufficient critical mass, restricted decision-making authority, investor bias, or the absence of complementary governance structures. Nevertheless, these mechanisms are not directly observed in the present study. The BGD measure only captures the proportion of female directors and does not distinguish their tenure, expertise, independence, committee participation, or leadership responsibilities. Therefore, the positive BGD×CAR interaction establishes only that the market-value association of numerical board gender diversity becomes more favourable as capital adequacy increases. It does not directly demonstrate how individual female directors exercise governance influence.

4.6 Control Variables and Firm Value

Among the control variables, SIZE is negatively and significantly associated with PBV ($\beta = -4.5865$; $p < 0.001$), whereas ROA and NPL are not statistically significant. Because SIZE is measured as the natural logarithm of total assets, a 10% increase in total assets corresponds approximately to a 0.0953 increase in SIZE and, based on the estimated coefficient, an approximately 0.437 decrease in PBV, holding the other model variables constant. This magnitude suggests that the negative size association is not only statistically significant but also economically relevant.

In banking, a larger asset base can provide diversification, operational stability, and greater capacity to absorb shocks. Nevertheless, these advantages do not necessarily produce a higher market-to-book valuation. Larger Indonesian banks may be more mature, complex, intensively regulated, and exposed to higher coordination and compliance costs. Their growth opportunities may also be perceived as more limited than those of smaller or digitally oriented banks. Because PBV measures market value relative to book equity, banks with rapidly expanding assets and equity may experience valuation compression when market expectations do not increase proportionately. The negative SIZE coefficient should therefore not be interpreted as evidence that larger banks are financially less stable. Rather, it suggests that, after controlling for bank-specific characteristics, investors may assign higher valuation multiples to banks with stronger growth expectations, greater strategic flexibility, or more efficient use of their asset base.

In the Indonesian setting, these findings indicate that the market does not evaluate sustainable finance, board diversity, and prudential capital independently. KUB financing reflects banks' implementation of the national sustainable-finance agenda, while CAR represents the prudential capacity to absorb risks arising from financial intermediation. Investors appear to evaluate whether sustainability commitments and governance attributes are supported by credible implementation capacity and economically productive use of capital. Consequently, compliance with sustainable-finance and governance expectations may not be sufficient by itself; market valuation also depends on how effectively banks translate these commitments into risk-adjusted financial outcomes.

5. Conclusion and Suggestion

This study examines the associations among Green Financing, Board Gender Diversity, CAR, and firm value in 47 Indonesian listed banks during the 2021–2024 period. Using a two-way fixed-effects model, the study finds that the relationships of Green Financing and Board Gender Diversity with PBV are conditional on the level of CAR. After mean-centering, the lower-order effects of Green Financing and Board Gender Diversity are statistically insignificant at the average CAR level. However, the Green Financing–CAR interaction is negative and statistically significant, whereas the Board Gender Diversity–CAR interaction is positive and statistically significant.

Formal conditional-effect tests provide a more nuanced interpretation of these interactions. Green Financing has a statistically significant negative association with PBV when CAR exceeds 47.37%, while its association is statistically insignificant at lower observed CAR levels. Board Gender Diversity has a statistically significant negative association with PBV when CAR is below 25.58%, is statistically insignificant between CAR levels of 25.58% and 222.66%, and becomes significantly positive only above 222.66%. However, only two bank-year observations exceed the upper threshold. The positive conditional effect of Board Gender Diversity at exceptionally high CAR levels should therefore be interpreted cautiously.

These findings support the interpretation of CAR as an asymmetric boundary condition because the conditional relationships differ between Green Financing and Board Gender Diversity. Nevertheless, the results establish conditional associations rather than causal market responses. The study does not demonstrate that CAR causes investors to reward or penalize sustainability and gender-diversity initiatives. Signalling substitution, overcapitalization, managerial risk aversion, delayed green-project returns, investor bias, and

limited female-director influence represent possible theoretical explanations, but these mechanisms are not directly measured or empirically distinguished in this study.

The robustness analysis also indicates that the magnitudes and statistical significance of the principal coefficients are sensitive to extreme PBV and CAR observations. Consequently, the findings should be regarded as sample- and period-specific evidence rather than relationships that necessarily apply uniformly across Indonesian banks. Overall, the study contributes to sustainable-finance and corporate-governance research by showing that the valuation associations of sustainability and board-composition indicators should be examined in conjunction with banks' prudential conditions.

6. Limitations and Future Research

Despite its contributions, this study is subject to several limitations. First, the sample is limited to Indonesian listed banks observed over a relatively short period from 2021 to 2024. Second, although bank fixed effects control for time-invariant heterogeneity, the research design does not fully address potential endogeneity, simultaneity, or reverse causality. Banks with higher market valuations may have greater capacity to expand green financing, strengthen capital buffers, or modify their board composition. Accordingly, the estimated coefficients should be interpreted as conditional associations rather than definitive causal effects. Third, although the two-way fixed-effects robustness test controls for common annual shocks, the relatively short four-year observation period limits the ability to examine longer-term economic, regulatory, and sustainable-finance developments. Fourth, the study relies on secondary disclosures whose completeness and classification may vary across banks. Finally, the presence of extreme PBV and CAR observations may influence the magnitude of the estimated coefficients, even though the use of Tobin's Q provides evidence that the general pattern of the findings is not confined to the PBV measure.

Future studies could address these limitations by employing longer observation periods, year fixed effects, lagged explanatory variables, dynamic panel estimators, or instrumental-variable approaches. Further robustness analyses may apply winsorisation or alternative treatments of extreme observations and use standard errors that are robust to heteroskedasticity, serial correlation, and cross-sectional dependence. Researchers could also incorporate additional bank-specific characteristics, such as the loan-to-deposit ratio, net interest margin, operational efficiency, ownership structure, and bank category, provided that consistent data are available across the sample period.

This study operationalises Board Gender Diversity solely through the percentage of female members on the Board of Directors. Although this proxy is widely used to capture the numerical representation of women, it does not reflect critical mass, executive authority, tenure, independence, professional expertise, committee membership, leadership positions, or substantive participation in strategic decisions. The results should therefore not be generalised as a comprehensive assessment of gender diversity in corporate governance. Future studies could complement the proportion-based measure with a female-director dummy, the Blau Index, the Shannon Index, or critical-mass thresholds. More detailed research could also distinguish female directors according to their authority, expertise, independence, tenure, committee participation, and leadership responsibilities.

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