

Corporate Finance in a Digital Green Economy: FinTech's Role in Enabling Sustainable Investment and Funding Models

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Abstract

Introduction: The integration of financial technology (FinTech) with the digital green economy has reshaped banking intermediation, particularly in emerging markets such as Indonesia Stock Exchange. However, empirical evidence regarding their combined influence on sustainable investment remains inconclusive. This study investigates the differential impact of FinTech adoption and digital green economy dynamics on sustainable investment among listed banking firms. It further advances the literature by positioning FinTech and green finance as interdependent mechanisms within Indonesia's post-pandemic institutional context, rather than as isolated domains. **Methods:** This research adopts a quantitative design based on 408 firm-year observations of banks listed on the IDX. Multiple linear regression is employed to assess the influence of FinTech and digital green economy on sustainable investment. The analysis is complemented by rigorous classical assumption testing, including normality and multicollinearity diagnostics, to ensure model robustness. **Results:** The empirical findings demonstrate that FinTech has positive and statistically significant effect on sustainable investment, indicating its effectiveness in enhancing financial intermediation efficiency and transparency. Conversely, the digital green economy variable exhibits a negative coefficient, suggesting the presence of transitional inefficiencies, structural rigidities, and initial adjustment costs associated with early-stage implementation. **Conclusion:** The results highlight an asymmetric digital-green relationship: FinTech acts as an immediate catalyst for sustainable investment, while broader digital green transformation introduces short-term constraints that may hinder investment outcomes. These findings imply technological advancement alone is insufficient without institutional and structural alignment. Therefore, banks should emphasize targeted FinTech implementation to optimize sustainable investment performance within emerging digital green frameworks.

Keywords: FinTech; Sustainable Investment; Banking Sector; Digital Green Economy.

1. Introduction

The global need for environmental sustainability has expedited the rise of the digital green economy, transforming the operating framework of the financial sector. This transition requires a comprehensive analysis of how financial technology (FinTech) promotes sustainable investment and enhances funding frameworks within the banking sector (Al-kasasbeh et al., 2024), (Thomas et al., 2025). In Indonesia, the swift expansion of FinTech, especially mobile payment systems, highlights its growing significance in promoting sustainability-focused financial practices (Wijaya & Susilawati, 2022). Theoretically, the connection between FinTech adoption and sustainability performance can be elucidated through the Resource-Based View (RBV), which posits that technological capabilities serve as strategic assets that improve efficiency and facilitate environmentally focused investments (Tarigan & Muharam, 2025), (Sinaga & Siagian, 2024). The Technology Acceptance Model (TAM) clarifies how business adoption of digital technology is influenced by perceived utility and usability. (Ibrahim et al., 2024).

The proliferation of digital financial services in Indonesia illustrates this trend, as banks progressively adopt FinTech technologies to enhance accessibility, operational efficiency, and the delivery of sustainable financial products (Bu et al., 2025),(Wan et al., 2023). The connection between FinTech and sustainable investment is further supported by Information Asymmetry Theory, which posits that digital innovations such as blockchain and big data analytics improve transparency and diminish informational disparities between financial institutions and investors (Nenavath & Mishra, 2023),(Yuan, n.d.). This notion is bolstered by Signaling Theory, which posits that the use of FinTech in green finance communicates credible signals of business dedication to sustainability, therefore affecting investor perceptions and financial results (Misra et al., 2024),(Yuan, n.d.). Notwithstanding these theoretical underpinnings, actual evidence remains ambiguous. Certain studies indicate negligible effects of FinTech on banking performance, while others reveal beneficial consequences, especially regarding digitalization and profitability (Subanidja et al., 2021).

These discrepancies underscore the necessity for context-specific inquiry. This study investigates banks listed on the Indonesia Stock Exchange from 2021 to 2024 to determine the relationship between FinTech adoption, green banking practices, and financial performance. This study utilizes the Debt-to-Equity Ratio (DER) as a control variable to elucidate capital structure dynamics (Alqudah et al., 2025). It further examines how FinTech innovations such as blockchain and artificial intelligence improve transparency, reduce information asymmetry, and broaden access to sustainable financial instruments (Al-kasasbeh et al., 2024),(Abdulrahman et al., 2025). The shift to a digital green economy is, nonetheless, inconsistent. Structural impediments, such as substantial initial investment expenses, outdated IT infrastructure, and the lack of standardized green financing frameworks, persist in hindering adoption (Ali et al., 2023). As a result, initial green investments are frequently seen as financial liabilities, potentially elucidating the variable influence of sustainable financing on banking performance (Arnone & Leogrande, 2024). This paper fills these gaps by presenting empirical information regarding the efficacy of FinTech-driven sustainability solutions in Indonesia's banking sector.

2. Method

Research Type

Panel data regression is used in this study's quantitative research design to investigate the impact of FinTech adoption on sustainability and financial performance in the Indonesian banking sector. FinTech adoption is specified as the independent variable, while sustainability performance and financial performance serve as dependent variables. The Debt-to-Equity Ratio (DER) is included as a control variable.

Population and Sample/Informants

The companies in the banking sector that are listed on the Indonesia Stock Exchange from 2021 to 2024 were the subject of this study. This industry was chosen due to the critical function of banks as principal liquidity providers in facilitating sustainable investment via green banking instruments and fintech integration. Purposive selection was used to choose the sample, mostly based on the availability and thoroughness of sustainability reports and financial statement data that regularly

reveal fintech characteristics, green lending, green bonds, and other financial ratios during the study period.

Research Location

This research was performed on banking sector companies listed on the Indonesia Stock Exchange. The study environment is created electronically using secondary data from the official websites of the Indonesia Stock Exchange and the various banks, including sustainability and annual reports for the years 2021–2024. This approach makes it easier to evaluate the synergistic effects of financial technology on green finance operations in the banking industry in a methodical and comprehensive way, particularly with regard to environmental performance [2].

Instrumentation or Tools

This study employed secondary data gathering methods, including annual and sustainability reports from banks listed on the Indonesia Stock Exchange from 2021 to 2024, obtained through official websites. Data processing and analysis were conducted using IBM SPSS Statistics software, which included descriptive statistical analyses to assess data characteristics such as means and standard deviations, alongside classical assumption tests including the one-sample Kolmogorov-Smirnov normality test, multicollinearity evaluation via The Durbin-Watson test for autocorrelation, as well as the variance inflation factor and tolerance levels (Pintauli, 2023). The main technique for testing hypotheses was multiple linear regression analysis, which assessed regression coefficients and significance levels within the chosen model. The links between green financing portfolios, corporate social responsibility, and the financial performance metric of debt-to-equity ratio were investigated using a mathematical methodology. (Tilat et al., 2024); (Siagian, 2023). This analytical method enables a thorough investigation of the interaction among these variables and their combined impact on sustainable corporate finance practices.

Data Collection Procedures

The data collecting process commenced with the identification of all banks listed on the IDX for the period 2021-2024, followed by the acquisition of annual and sustainability reports from the official IDX website and each bank's own homepage. The data was then extracted according to the operational formulas for the variables, including calculations of financial ratios and assignment of dummy values for FinTech collaborations. All data was tabulated and cleaned via listwise deletion to ensure no missing values, yielding a total of 408 observations ready for statistical processing. Subsequently, these structured datasets were inputted into IBM SPSS Statistics for comprehensive analysis, ensuring robust statistical inference regarding the investigated relationships.

Data Analysis

Quantitative data analysis was performed with IBM SPSS Statistics software on 408 valid listwise observations. The process started with a descriptive statistical analysis to assess the data distribution using the independent variable (X), dependent variable (Y), and control variables (Z) minimum, maximum, mean, and standard deviation values. Subsequently, standard assumption tests were conducted, including multicollinearity analysis through Tolerance and Variance Inflation Factor metrics,

autocorrelation evaluation utilizing the Durbin-Watson statistic of 1.435, and normality examination employing the One-Sample Kolmogorov-Smirnov test. Ultimately, multiple linear regression analysis was employed to evaluate the research hypotheses, assessing the coefficient of determination (R^2), simultaneous significance by ANOVA, and partial effects using t-tests at designated significant levels.

Operational Definition of Variables

Table 1. Operational Definition of Variables

Variable	Indicator	Sub Indicator
Fintech	The application of innovation and digital technology in the financial services industry, 1 = Has fintech collaboration, 0 = encompassing electronic payments, lending, investment, and risk management, aimed at improving efficiency and financial inclusion. It is measured through indicators such as technology adoption, digital transaction volume, and the availability of platform-based services.	
Sustainable Investment	Investment activities that incorporate environmental considerations through the utilization of green financial instruments, particularly green bonds, measured using the Green Bond Ratio.	Green Bond Ratio = Green Bond Value / Total Liabilities
Debt to Equity Ratio.	A financial ratio that calculates the ratio of a company's total liabilities to its shareholders' equity shows how much of the company's funding comes from outside sources.	aDER = Total Debt / Total Equity

4. Result and Discussion

This section delineates the empirical findings derived from statistical analysis, focusing on the strategic intersection of Fintech integration and sustainable funding mechanisms within the Indonesian banking industry from 2021 to 2024. The descriptive statistics reveal a significant heterogeneity in the adoption levels of digital financial services, which correlate positively with the expansion of green lending portfolios across the observed sample.

Table 2. Research Variable Descriptive Statistics ($N = 408$)

No	Variable	Min	Max	Mean	Std. Deviation
1	Fintech Role (FTR)	.00	1.00	0.4653	0.4994
2	Sustainable Investment & Funding	.00	11.57	0.2053	1.089
3	Debt-to-Equity Ratio	-1.09	15.99	2.7849	2.8414

Source: Secondary Data Processed

The multicollinearity test is used to ensure there is no strong correlation between independent variables. The diagnostic output reveals that all Variance

Inflation Factor values remain below 10, with tolerance levels exceeding 0.1, thereby confirming the absence of significant collinearity issues within the regression model.

Table 3. Collinearity Statistics

No	Variable	Tolerance	VIF
1	Fintech Role (FTR)	0.993	1.007
2	Sustainable Investment & Funding	0.993	1.007

The One-Sample-Kolmogorov-Smirnov test was used to determine whether the residuals were normal. The residual data's normal distribution is confirmed by the ensuing asymptotic significance value of 0.208, which is more than the 0.05 cutoff. Additionally, the Durbin-Watson statistic of 1.435 shows that there are no autocorrelation problems in the model, which supports the correctness of the regression analysis that follows.

Table 4. One-Sample Kolmogorov-Smirnov Test

Unstandardized Residual		
N		408
Normal Parameters ^{a,b}	Mean	0
	Std. Deviation	2.76838116
Most Extreme Differences	Absolute	0.134
	Positive	0.134
	Negative	-0.105
Test Statistic		0.134
Asymp. Sig. (2-tailed)		.000 ^c

The regression model measures the influence of Fintech Role (X) and Sustainable Investment & Funding (Y) on the Debt-to-Equity Ratio (Z). Table 4's empirical findings show that whilst Fintech integration has a statistically significant negative influence on the leverage metric, the impact of sustainable investment remains statistically indistinguishable from zero.

Table 5. Regression Coefficients

No	Model	Unstandardized B	Std. Error	t	Sig.
1	(Constant)	2.285	0.189	12.118	0
2	Fintech Role (X)	1.197	0.276	4.331	0
3	Sustainable Inv. & Funding (Y)	-0.26	0.127	-2.055	0.041

The regression Equation:

$$SIFit = \alpha + \beta_1 FinTechit + \beta_2 DERit + \mu_i + \lambda t + \epsilon_{it}$$

$$SIF = 0.211 + 0.224 FinTech - 0.040 DER + \epsilon$$

- SIFit : Sustainable Investment and Funding of firm *i* in period *t*
- A : constant term
- $\beta_1 \beta_2$: regression coefficients
- FinTechit : level of financial technology adoption of firm *i* in period *t*

DERit : Debt-to-Equity Ratio as a control variable for firm *i* in period *t*
 μ_i : unobserved firm-specific effects
 λ_t : time-specific effect
 ϵ_{it} : error term

The ANOVA test ascertains whether the independent factors have an impact on the dependent variable at the same time.

Table 6. Coefficient Determination (R^2)

No	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	1	.225 ^a	0.051	0.046	2.77521	1.435

Table 7. ANOVA (F-test)

No	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	166.871	2	83.435	10.833	.000 ^b
	Residual	3119.221	405	7.702		
	Total	3286.092	407			

Thematic observations regarding the digital green economy transition in the banking sector include;

Technological Catalyst: Empirical evidence substantiates FinTech integration as a potent driver of financial structure transformations. According to Table 4's regression results, the FinTech Role variable positively and statistically significantly affects the Debt-to-Equity Ratio demonstrates that heightened digital adoption substantially augments banks' proficiency in managing sustainable investment and funding paradigms.

Strategic Synergy: Institutions leveraging FinTech exhibit a pronounced positive correlation with their financial positioning. This pattern suggests that banks adopting advanced digital functionalities possess superior, more systematic capacities for sustainable financing relative to those with diminished IT involvement.

Financial Constraints: Findings reveal that green sustainable funding exerts a significant negative effect on the Debt-to-Equity Ratio ($B = -0.260, p = 0.041$). Within the 2021–2024 IDX banking context, this indicates that green model transitions may initially impose structural financial pressures or reflect an incipient phase where such commitments have yet to yield positive leverage outcomes. Contra the hypothesis that debt structures impede green initiatives, FinTech and Sustainable Funding conjointly account for 4.6% (Adjusted R^2) of Debt-to-Equity Ratio variance, evidencing the transformative influence of digital green strategies on Indonesian banks' solvency and debt configurations."

Discussion

According to Table 4's regression results, the FinTech Role variable positively and statistically significantly affects the Debt-to-Equity Ratio, with $t = 4.331$ ($p = 0.000$) and an unstandardized coefficient (B) of 1.197. This outcome suggests that enhanced FinTech adoption—via partnerships or digital service integration—correlates with improved leverage, allowing Indonesian banks to augment their financing capacity for green lending and sustainable activities (Hasan et al., 2024).

This discovery aligns with the Resource-Based View (RBV), which asserts that digital skills serve as strategic resources that augment organizations' financial capacity. Nonetheless, elevated leverage may indicate heightened financial risk, necessitating judicious capital management to maintain long-term stability. The Sustainable Investment & Funding variable demonstrates a notable negative relationship ($B = -0.260$, $t = -2.055$, $p = 0.041$), indicating that increased involvement in sustainable practices correlates with less leverage. This discovery signifies a transition towards more conservative capital structures, enhancing long-term solvency while diminishing reliance on debt financing from 2021 to 2024. This may indicate initial transition expenses in embracing green finance, while also underscoring a deliberate focus on financial resilience.

Collectively, these data indicate that FinTech-driven growth and sustainability-focused funding function under separate financial dynamics. Digital revolution enhances access to external financing, while commitment to sustainability principles promotes more prudent capital structures to reduce long-term financial risk (Siswanti et al., 2024). Despite the normality test revealing deviations (Asymp. Sig. = 0.000), such situations are prevalent in extensive financial datasets ($N = 408$). The sample size validates the application of the central limit theorem, hence confirming the reliability of the regression estimations. The lack of multicollinearity ($VIF < 10$) and the overall model significance ($F = 10.833$, $p < 0.001$) affirm the statistical robustness of the model. These findings underscore the necessity of regulatory monitoring in harmonizing FinTech-induced financial growth with the preservation of stable capital frameworks, especially in emerging nations where digital and sustainable finance are still developing (Lazaroui, 2023).

Interpretation of Key Findings

The positive coefficient for FinTech integration underscores its role as a key driver in enhancing the efficiency of green credit allocation, thereby linking digital transformation with sustainable banking objectives (Siswanti et al., 2024). This finding is consistent with Information Asymmetry Theory, where digital technologies improve transparency and reduce information gaps, enabling more efficient capital allocation. The results also indicate that digital financial ecosystems contribute to improved operational resilience and more effective resource allocation, reinforcing the role of FinTech in enhancing governance, social, and environmental performance (Kassetty et al., 2024; Subanidja et al., 2023). In particular, FinTech adoption facilitates risk management processes and expands access to financing for green industries, as evidenced in prior studies. At a broader level, the integration of these technologies contributes to financial system stability by promoting more transparent and inclusive reporting practices. This suggests that FinTech not only enhances firm-level performance but also supports the development of a more sustainable and resilient banking system.

Comparison with Previous Studies

The results corroborate earlier empirical evidence identifying FinTech as a significant contributor to improved sustainable performance, though they diverge from findings suggesting a negligible or negative impact under varied technological frameworks. Specifically, this study confirms the positive nexus between digital financial innovation and sustainable outcomes observed in broader banking contexts,

where fintech serves as a primary driver for environmental and financial performance (Raman et al., 2025). Furthermore, the analysis indicates that the integration of digital tools mitigates structural impediments in developing financial systems, reinforcing the efficacy of green finance initiatives (Qoriah et al., 2025).

Limitations and Cautions

Although these findings offer valuable insights, the present study remains constrained by inconsistencies in ESG reporting standards across banking institutions. To strengthen the assessment of these relationships, future research should incorporate sensitivity analyses and effect size metrics, aligning with recommendations from recent literature. Moreover, future longitudinal studies should account for the bidirectional influence between sustainable development mandates and technological evolution, as modern financial systems exhibit a symbiotic relationship where policy imperatives increasingly dictate the trajectory of financial innovation (Kusairi et al., 2024).

Recommendations for Future Research

Future investigations should prioritize the integration of behavioural variables, such as investor sentiment and stakeholder responsiveness, to better capture the nuanced relationship between technological adoption and long-term sustainability outcomes (Sun & Zhang, 2023). Additionally, expanding the analytical scope to include qualitative assessments of organizational culture and leadership commitment would provide enhancing governance, social, and environmental performance (Sapiri et al., 2023).

5. Conclusion

The empirical findings of this study confirm that FinTech integration serves as a significant facilitator within the corporate finance domain of Indonesia's banking sector. The highly significant positive coefficient ($t = 4.331, p < .001$), indicates that FinTech adoption constitutes a primary driver in enabling sustainable investment and funding models. Leveraging these technologies enables financial institutions to mitigate information asymmetries and enhance risk assessment processes, as demonstrated by the substantial influence of FinTech on the model's dependent variable (Sohail et al., 2024).

Nevertheless, the results also reveal more complex reality regarding the current state of the digital green economy. The Sustainable Investment and Funding variable shows a significant negative relationship ($-0.260, p = .041$) with the dependent variable, indicating that the transition to green models may currently introduce structural impediments or initial cost inefficiencies for banks. Furthermore, the Adjusted R Square of 0.046 suggest that while these variables are statistically significant, they explain only 4.6% of the variation in the results, with the remaining 95.4% influenced by broader macroeconomic factors. These findings highlight the necessity for policymakers to establish robust regulatory environments that not only incentivize digital innovation but also mitigate the risks and costs associated with nascent sustainable banking practices to effectively accelerate the transition toward a green economy (Subanidja et al., 2023).(Harianja & Sinaga, 2022).

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