The Effect of Green Banking Activities on Firm Value with Profitability as an Intervening Variable on Digital Service-Based Banks Listed in Asia

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Abstract
Green Banking is a business practice integrates the Triple-Bottom-Line (People, Planet, Profit) principles into banking operations and business decisions, to promote sustainability and long-term profitability, thereby increasing the value of the firms. The research aims to investigates the impact of green banking activities on value of the firms with profitability serving as an intervening variable. The study uses green financing distribution [KKUB], cost efficiency [BOPO] as proxies for green banking activities, return on asset [ROA] as a proxy for profitability, and price to book value [PBV] as a proxy for value of the firm. Object of the research focuses on 14 listed digital service-based banks in Asia, comprising 9 Indonesian banks, 1 Vietnamese bank, 1 Philippines bank, 1 Korean bank, and 1 Japanese bank. Multiple linear regression analysis is used to analyze the data. The results indicate that green banking practices influence the profitability of digital service-oriented banks in Asia, but have no impact on the firm's value, even when intervened by profitability.

Keywords: *green banking, green financing, efficiency operational cost, return on assets, corporate value, price to book value*

Kelompok BoK yang bersesuaian dengan artikel: *Engineering Management*

1.   Introduction

Sustainable development is development that considers the needs of both the present and future generations (Brundtland, 1987). To achieve this, the concept of Green Banking has emerged, which integrates environmental and social considerations into banking practices (Peraturan Otoritas Jasa Keuangan, 2017). By incorporating the Triple-Bottom-Line (People, Planet, Profit) into their operations, banks can create a sustainable business and generate long-term profits. This can be measured through indicators such as the Price-to-Book Value (PBV) ratio, which represents the ratio of the stock market price to the book value of the stock (Brigham & Ehrhardt, 2014). According to Brigham & Ehrhardt (2014), a higher PBV ratio indicates investors' expectations of higher future profits, thus increasing the company's value. In the context of green banking, long-term profitability is achieved by integrating the triple-bottom-line principles into operational activities, focusing not only on maximizing

shareholder profits but also addressing environmental sustainability and social awareness within the community (Dewi & Dewi, 2017).

Based on research by Subanidja et al. (2022), the development of digital banks and fintech has influenced the implementation of sustainable finance in banks. Referring to Dewi & Dewi's research (2017), the use of green finance or sustainable finance has a long-term impact on business sustainability, which is reflected in the increase in company value (PBV). Based on Rahmawati's (2020) study, the company's PBV is positively correlated with the ROA ratio, which measures the profitability generated by the company's assets (Sudana, 2015).

Figure 1. Data digital banks in Asia
(source: financial reports & indeks stock price from various website)

Based on Figure 1, it can be seen that in digital banks in Asia, the increase and decrease of the firms' value (PBV) in digital banks is not always in line with the changes of the enterprise profitability (ROA). This shows that there is a gap in digital banks' business performance. Therefore, the problem in this study is how to increase the PBV of digital banks in Asia that listed in stock exchange?

According to Rahmawati (2020), the company's PBV is influenced by the firms' profit (ROA). Based on the research of Yatie & Tandika (2019), the firms' profit (ROA) is significantly influenced by the implementation of green investments as measured by the Ministry of Environment's PROPER (Corporate Performance Rating Assessment Program in Environmental Management) rating. However, Hasanah & Hariyono's research (2022) shows different results, stating that the application of green finance has no impact on banks' profits (ROA). A similar argument is also generated by Iqbal's research (2020)which states that green banking has no significant effect on Islamic banking profits.

Based on the research of Hasanah & Hariyono (2022) and Muhajir et al. (2017), the firms' profit (ROA) is negatively affected by the ratio of operating expenses to operating income (BOPO). When the ratio of operating expenses to operating income increases, the company becomes less efficient, resulting in lower profitability and a decrease in firm value. This

argument is supported by the results of Nurrahmawati's (2019) research, which shows that the BOPO ratio has a negative effect on firms' value (PBV). However, based on the research of Muhajir et al. (2017), Pratama (2019) found that the BOPO ratio has no effect on firms' value (PBV). The difference in the results of previous studies will be a research gap for this study.

Based on the phenomenon gap of digital banks in Asia and the research gap of previous studies, the focus of this research is related to how to increase the firm value (PBV) of digital banks in Asia by channeling green financing (KKUB), making cost efficiency (BOPO), and increasing firms' profits (ROA). Therefore, this study is entitled "The effect of green banking activities on firm value with profitability as an intervening variable on listed digital banks in Asia".

2. Methods

This research uses a quantitative approach with multiple linear regression analysis techniques using the Eviews 10 application. Multiple linear regression analysis is used to model the relationship between the dependent variable (Price-to-Book Value) and several independent variables (green financing distribution, ratio operating expenses to operating income, and ratio return on assets), as illustrated in the following framework:
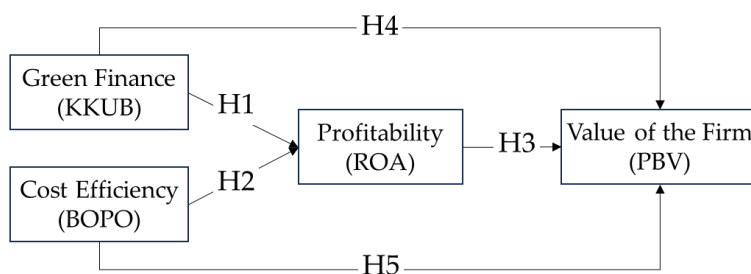

Figure 2. Research framework

Based on this research framework, the research hypotheses are as follows:

H1: Lending to sustainable activities (green finance) has an impact on firms' profitability (return on assets).

H2: Operational efficiency, which measured by ratio operating expenses to operating income (BOPO) has an impact on firms' profitability (return on assets/ROA).

H3: Firms' profitability (return on assets/ROA) has an impact on firms' value (price-to-book value/PBV).

H4: Lending to sustainable activities (green finance) has an impact on firms' value (PBV) with profitability (ROA) as an intervening variable.

H5: Operational efficiency, which measured by ratio operating expenses to operating income (BOPO) has an impact on firms' value (PBV) with profitability (ROA) as an intervening variable.

The operational definitions of the variables used are illustrated in the following table:

Table 1. Definition of operating variable

No.	Variables	Definition of Variables	Measurement Formula
1.	Green finance (KKUB)	The volume of banks' lending to sustainable business sectors.	Lending volume to sustainable businesses
2.	Operating expenses to operating income (BOPO)	The level of efficiency banks measured by the efficiency of operating expenses relative to its operating income.	$\frac{\text{Operating Expenses}}{\text{Operating Income}} \times 100\%$
3.	Return on assets (ROA)	An indicator of the ability of banks' assets to generate net profit.	$\frac{\text{Net Profit Before Tax}}{\text{Total Assets}} \times 100$
4.	Price-to-Book Value (PBV)	Ratio to measured stocks price to book value of the share	$\frac{\text{Market Value per Share}}{\text{Book Value per Share}}$

The data analyzed covers the digital banks in Asia that are listed on the stock exchange, including PT Bank Jago Tbk, PT Bank MNC Internasional Tbk, PT Bank Aladin Syariah Tbk, PT Allo Bank Indonesia Tbk, PT Bank KB Bukopin Tbk, PT Bank Neo Commerce Tbk, PT Bank BTPN Tbk, PT Bank Raya Indonesia Tbk, PT Bank Amar Indonesia Tbk, Vietnam Prosperity Joint Stock Commercial Bank, AEON Credit Service (Malaysia) Berhad, Union Bank of the Philippines, Kakao Bank Corp. Korea, and Seven Bank, Ltd. Japan. These fourteen banks represent some of the key players in the digital banking industry in Asia.

The data used in this study is secondary data from financial reports and stock price history retrieved from company websites and stock exchange websites. The data is comprised of annual records for the period of 2020-2022, which corresponds to the timing of digital banks' entry into the stock market.

The linear regression method is used to analyze the panel data in this study. Based on the results of the Chow test, Hausmann test and Lagrange Multiplier test, the most suitable panel data regression estimation method selected for this study is the Generalized Least Square (GLS) technique or the Random Effect Model. The relationship between variables is represented by the following equation to illustrate its effect.

2.1. The impact of green finance (KKUB), cost efficiency (BOPO) on profitability (ROA)

$$ROA = \alpha + \beta 1.KKUB + \beta 2.BOPO + \varepsilon \qquad (1)$$

Note,
ROA = firms' profitability
α = regression constant
β = regression coefficient of each variables
$KKUB$ = green finance
$BOPO$ = comparison of operating expenses to operating income
ε = residual/error

2.2. The impact of green finance (KKUB), cost efficiency (BOPO), and profitability (ROA) on firms' value (PBV)

$$PBV = \alpha + \beta 1.KKUB + \beta 2.BOPO + \beta 3.ROA + \varepsilon \qquad (2)$$

Note,
PBV = value of the firm
α = regression constant
β = regression coefficient of each variables
$KKUB$ = green finance
$BOPO$ = comparison of operating expenses to operating income

ROA	= firms' profitability
ε	= residual/error

To determine the role of profitability (ROA) as an intervening variable in the relationship between green financing distribution (KKUB) and cost efficiency (BOPO) on firms' value (PBV), a Sobel test was performed using the subsequent formula:

$$t_{statistic} = \frac{ab}{\sqrt{(b^2 SEa^2) + (a^2 SEb^2)}} \tag{3}$$

Note,

$t_{statistic}$	= result from sobel test
a	= coefficient of independent variable towards intervening variable
b	= coefficient of intervening variable towards dependent variable
SEa	= standard error of independent variable
SEb	= standard error of intervening variable

If the t-statistic value based on the Sobel test is greater than or equal to 2.02 (t-table), then the profitability variable (ROA) may intervene the influence of the independent variables, namely green finance (KKUB) and cost efficiency (BOPO), on the dependent variable, namely the firms' value (PBV) (Ghozali, 2018).

3. Result & Discussion

Based on the results of a multiple linear regression analysis conducted using the Eviews10 program, the following results were obtained.

3.1. Descriptive analysis of data's variable

Table 2. Summary of variables data for digital banks in Asia

Variables	Value	Mean	Min	Median	Max
Green Finance (KKUB)	IDR-bio	13,215,043	-	1,469	209,009
Cost Efficiency (BOPO)	%	118.09%	52.38%	85.13%	428.40%
Firms' Profit (ROA)	%	-0.67%	-14.75%	0.87%	6.19%
Firms' Value (PBV)	point	23.34	-	5.73	160.00

The results of the descriptive analysis of the data used in this study are shown in table 2. The data reveals a varied distribution of green finance (KKUB), with some banks not distributing any, while others have distributed significant amounts, reaching up to Rp 209 trillion, with an average of Rp 1.4 trillion. This suggests that not all digital banks in Asia have engaged in green finance.

The high operational cost has a negative impact on the banks' profitability, with the lowest return on assets (ROA) reaching -14%. On average, digital banks in Asia exhibit a low ROA ratio, reaching 0.87% or below 5%. This indicates that the profit generated by the average digital bank is not adequate.

Furthermore, the analysis examines the cost efficiency of these banks, measuring the operational cost as a percentage of operational income (BOPO). The average operational cost is found to be 85% of the income, with the lowest cost efficiency ratio reaching 52% (highly efficient) and the highest reaching 428% (inefficient, loss-making company).

Interestingly, despite the low ROA, the average share price of digital banks can reach five times the book value of their shares, with some even reaching 160 times. However,

there are also digital banks with zero enterprise value (PBV). The relationship between green finance, cost efficiency, profitability, and firms' value is further explored in the following section.

3.2. The impact of green finance (KKUB) and cost efficiency (BOPO) on profitability (ROA)

Table 3. The impact of KKUB and BOPO to ROA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constanta	0.060890	0.007754	7.852870	0.0000
KKUB	-2.743641	9.050000	-0.303085	0.7634
BOPO	-0.056918	0.004294	-13.25630	0.0000
R-squared	0.821337			
Adjusted R-squared	0.812175			
F-statistic	89.64411			
Signif. (F-statistic)	0.000000			

Based on the data presented in Table 3, it is evident that the distribution of green financing (KKUB) has little impact on the profitability of digital banks listed on the Asian stock exchange. This is reflected in the probability value of the t-test, which exceeds α (0.05) at 0.7634. This is due to the fact that the distribution of green finance in digital banks is not widespread enough. Two digital banks, Seven Bank in Japan and Motion (MNC) Bank in Indonesia, have not distributed any green financing during the study period. Additionally, two digital banks, Aladdin Syariah Bank in Indonesia and AEON Credit in Malaysia, did not distribute green financing until 2022. Kakao Bank, a Korean digital bank, began disbursement of green financing in 2021, amounting to KRW 15.6 trillion, and grew by 8% in 2022, reaching KRW 16.9 trillion. The result supporting the research findings conducted by Iqbal (2020), which indicate that green finance have no impact on ROA, but contradictive with research findings conducted by Yatie & Tandika (2019) which showed that green investment has positive impact on firms' profitability (ROA).

Meanwhile, in partial, the variable BOPO, which represents efficiency cost, negatively affect the profitability of digital banks listed on Asian stock exchanges. This is reflected in the t-test's probability value, which is 0.0000 or less than α (0.05). In other words, if the ratio of operating costs to operating income increases, the Company becomes less efficient, resulting in reduced profitability. This is consistent with research findings conducted by Hasanah & Hariyono (2022) and Muhajir et al. (2017).

Moreover, the company's profitability variable (ROA) is influenced by both the green finance variable (KKUB) and the efficiency cost (BOPO) simultaneously, as reflected in the significance value of F test, which reaches 0.0000 or less than α (0.05). Both variables can explained the ROA variable up to 81.2%, according to the adjusted R-squared test results, while the remaining 18.8% is explained by other variables not examined in this study. The findings of this study support the research findings conducted by Hasanah & Hariyono (2022), which indicate that both BOPO and KKUB variables have a simultaneous impact on the company's profitability (ROA), but contradicting the research findings conducted by Iqbal (2020).

The regression equation for the effect of KKUB and BOPO on ROA, based on the results of the data analysis presented in Table 3, is as follows:

$$ROA = 0.068090 - 2.743641 . KKUB - 0.056918 . BOPO \tag{4}$$

Based on Equation 4, the regression constant (α) has a value of 0.068090. This indicates that if the independent variables (KKUB and BOPO) remain absent or unchanged, the ROA value will be 0.068090. The regression coefficient value for KKUB (β. KKUB) is -2.743641, which means that assuming other variables remain unchanged (ceteris paribus), the ROA variable will decrease by 2.743641 if the KKUB variable increases by 1%. While the coefficient value for BOPO regression (β. BOPO) is -0.056918, meaning that if the BOPO variable increases by 1%, the ROA variable will decrease by 0.056918 assuming other variables remain constant.

3.3. The impact of green finance (KKUB), cost efficiency (BOPO) on firms' value (PBV) with profitability (ROA) as intervening variable

Table 4. The impact of KKUB, BOPO, ROA to PBV

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constanta	18.60365	20.30784	0.916082	0.3654
KKUB	2.37E-08	1.31E-07	0.180903	0.8574
BOPO	4.195265	15.04189	0.278906	0.7818
ROA	79.09831	236.7136	0.334152	0.7401
R-squared	0.004138			
Adjusted R-squared	-0.074482			
F-statistic	0.052635			
Signif. (F-statistic)	0.983828			

Based on the data in Table 4, it is evident that the three variables, namely green finance distribution (KKUB), cost efficiency (BOPO), and profitability (ROA), do not affect firms' value (PBV), either partially or simultaneously. This is indicated by the probability value of the t-test of the three variables (KKUB, BOPO and ROA) and the significance value of the F-test, which is greater than α (0.05). According to the adjusted R-squared value, the three variables only describe 7% of the value of the company, while the remaining 93% is described by other variables not tested in this study. The results contradicting with research findings conducted by Nurrahmawati (2019), which indicate that BOPO has negative impact on firms' value (PBV) and Rahmawati (2020), which indicate that ROA has positive impact on PBV. However, the result consistent with research findings conducted by Muhajir et al. (2017) and Pratama (2019), which indicated that BOPO has no impact on firms' value (PBV).

The regression equation for the effect of KKUB, BOPO, ROA on PBV, based on the results of the data analysis presented in Table 4, is as follows:

$$PBV = 18.603651 + 2.367632 . KKUB + 4.195265 . BOPO + 79.098313 . ROA \tag{5}$$

Based on Equation 5, it is evident that the regression constant value (α) is 18.603651, indicating that if all independent variables (KKUB, BOPO, and ROA) are either 0 or remain unchanged, the PBV value will be 18.603651. The regression coefficient value of KKUB (β. KKUB) is 2.367632, which means that with a 1% increase in the KKUB variable,

the PBV variable will also increase by 2.367632, assuming that other variables remain constant (ceteris paribus). The regression coefficient value for BOPO (β. BOPO) is 4.195265. This implies that an increase of 1% in the BOPO variable will lead to a 4.195265 increase in the PBV variable, holding other variables constant. Similarly, the regression coefficient value for ROA (β. ROA) is 79.098313. This suggests that an increase of 1% in the ROA variable will result in a PBV variable increase of 79.098313, assuming other variables remain constant.

The results from the Sobel test examining ROA as an intervening variable in the effect of green finance distribution (KKUB) and cost efficiency (BOPO) on firms' value (PBV) are presented in Table 5.

Table 5. The impact of KKUB & BOPO to PBV with ROA as intervening variable

	The impact of KKUB to PBV with ROA as intervening variable	The impact of BOPO to PBV with ROA as intervening variable
t-statistic formula	$$\dfrac{\beta_{KKUB} x \beta_{ROA}}{\sqrt{\left(\beta_{ROA}^2 x\, SE_{KKUB}^2\right) + \left(\beta_{KKUB}^2 x\, SE_{ROA}^2\right)}}$$	$$\dfrac{\beta_{BOPO} x \beta_{ROA}}{\sqrt{\left(\beta_{ROA}^2 x\, SE_{BOPO}^2\right) + \left(\beta_{BOPO}^2 x\, SE_{ROA}^2\right)}}$$
Constanta Value	β-ROA = 79.098313 SE-ROA = 236.7136 β-KKUB = -2.743641 SE-KKUB = 9.050000	β-ROA = 79.098313 SE-ROA = 236.7136 β-BOPO = -0.056918 SE-BOPO = 0.004294
t-statistic value	$$\dfrac{-2.744 x 79.098}{\sqrt{(79.098^2 x\, 9.050^2) + (-2.744^2 x\, 236.714^2)}}$$ = -0.225	$$\dfrac{-0.057 x 79.098}{\sqrt{(79.098^2 x\, 0.004^2) + (-0.057^2 x\, 236.714^2)}}$$ = -0.334
t-table value	2.023	

Table 5 shows that the results of the t-statistic using the Sobel test are less than the t-table (2.023). Therefore, it can be concluded that the firms' profitability (ROA) cannot intervene in the relationship between the variables of green finance distribution (KKUB) and cost efficiency (BOPO) to the firms' value (PBV). The result consistent with research findings conducted by Pratama (2019) which indicated that ROA cannot intervene the impact of BOPO on PBV. This can be attributed to the fact that the average ROA of digital banks listed on the Asian stock exchange is still below 5%, indicating that digital bank assets have not been able to generate optimal profits.

The suboptimal profitability of bank assets can be attributed to various factors such as low net interest margin, poor asset quality, and inefficiency in bank operations. An analysis of the Bank's operational efficiency data revealed that 50% of the research objects had BOPO ratio above 90%, indicating that the digital bank lacks efficiency in managing its operational costs. This inefficiency in operating costs can be attributed to high marketing and promotion expenses for customer acquisition, labor costs, and costs for technology investments. This is especially the case for digital banks in Indonesia, which have recently launched their products during the COVID-19 pandemic. Consequently, these banks incur significant costs for technology investments to meet customer demands and promotional expenses to introduce their products to the public and acquire new customers. The high operating expenses are one of the contributors to the suboptimal return on assets for the digital banks in Asia.

Optimizing the company's profits will affect the potential dividends generated for investors. Companies with low profits typically pay low dividends or none at all, which can impact investor interest in their shares. The more profit the company generates, the greater the investor interest in the shares, leading to a potential increase in share price.

This study on digital banks in Asia found that fundamental factors such as green lending (KKUB), efficiency cost (BOPO ratio), and ROA ratio did not affect stock prices, which measured by PBV ratio. As argued by Sukamulja (2021), investors also take into account technical (when to buy and when to sell) and psychological factors when buying shares. Thus, further research can investigate these factors along with fundamental factors.

4. Conclusion

According to the analysis, it has been found that the distribution of green financing (KKUB) and cost efficiency (BOPO) in digital banks on the Asian stock exchange does not significantly impact stock prices (PBV), although it is influenced by corporate profits (ROA). This is due to the fact that green lending is not a priority for these banks, as reflected in their low lending amounts (averaging only Rp 1.4 T). Additionally, the transition to digital banking during the pandemic has resulted in investment costs for technology development and promotional expenses in order to acquire new customers, leading to suboptimal profits. These factors contribute to investors not considering green finance and cost efficiency as important factors when valuing the company's share price.

Investors may not currently consider green financing when purchasing digital bank shares, but digital banks still need to pay attention to the composition of green financing in their overall financing distribution. This is because it has several important implications for their business.

Firstly, directing financing towards projects that support a sustainable economy, such as renewable energy and sustainable waste management, demonstrates a bank's commitment to environmental and social conditions. By actively engaging in these projects, digital banks can play a role in supporting environmentally and socially oriented economic growth.

Secondly, there is an increasing public awareness of environmental and social issues, leading to a growing interest in environmentally friendly products and services. Banks need to recognize this trend and develop products and services that are environmentally and socially friendly, in order to capitalize on the business opportunities and increase consumer satisfaction. Banks can also involve themselves in various financial initiatives that focus on Environmental, Social, and Governance (ESG) factors, which can help create a positive image and build trust with consumers.

Thirdly, the distribution of green financing can also serve as a risk management strategy for digital banks. By diversifying their portfolio to include sustainable business sectors, banks can reduce their exposure to risks arising from portfolios of environmentally unfriendly businesses. As public awareness of sustainable development increases, businesses that are not environmentally friendly may suffer financial decline, impacting their ability to fulfill their obligations to the bank. Therefore, it is important for banks to diversify their portfolios and anticipate these changes.

Moreover, the distribution of green financing is regulated by government and international institutions. There is an increasing emphasis on the concept of Sustainable Development Goals (SDGs), and regulators have established various incentives and requirements to encourage green banking. Banks that do not comply with regulations may face compliance, reputation, and legal risks. Therefore, digital banks need to pay attention to the distribution of green financing in order to avoid these risks and ensure compliance with regulations.

Finally, according to Sukamulja (2021), apart from fundamental factors, such as company performance, and technical factors, such as timing for buying or selling shares, there are also psychological factors that impact investors' decisions in purchasing company shares. When the market perceives a company's shares as attractive, the demand for those shares rises, consequently increasing stock prices. However, the study reveals that fundamental factors, such as ROA, BOPO, and KKUB ratios, do not have a direct influence on the stock prices (PBV) of digital banks in Asia. The study suggests that further research should be conducted to explore other variables related to fundamental factors in evaluating stock prices. Additionally, future research can also focus on analyzing technical factors and psychological elements that affect the purchase prices of stocks.

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