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THE DETERMINANTS OF GREEN FINANCE AND EFFECT ON THE BANKING SECTOR

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Abstract

This study examines the prerequisites and challenges faced by local and foreign commercial banks in Türkiye in supporting green business initiatives. This study uses backward logistic regression analysis to identify variables affecting green financing practices using annual data from Turkish deposit banks from 2012 to 2021. This study addresses the growing interest in understanding the role of commercial banks in promoting green finance and contributes to the existing literature by revealing the current efforts of Turkish commercial banks in this area. The main findings show that factors influencing green financing practices are derivative financial assets, loans, tangible assets, equity capital, company size, female representation on boards, presence of audit committees and company experience. The study highlights the relationship between these factors and green financing methods adopted by depository banks. It is worth noting that the assets of these banks were built within the framework of green financing and practices such as green buildings, green loans and green bonds were introduced. In addition, the size and experience of custodian banks help influence their green financing practices. The findings provide a framework for policy makers, practitioners and academics who wish to gain a deeper understanding of the dynamics of Turkish financial institutions and green finance.

JEL classification: G21, G23, M41

Keywords: Investment, Green finance, profitability, banking sector, logistic regression, commercial banks

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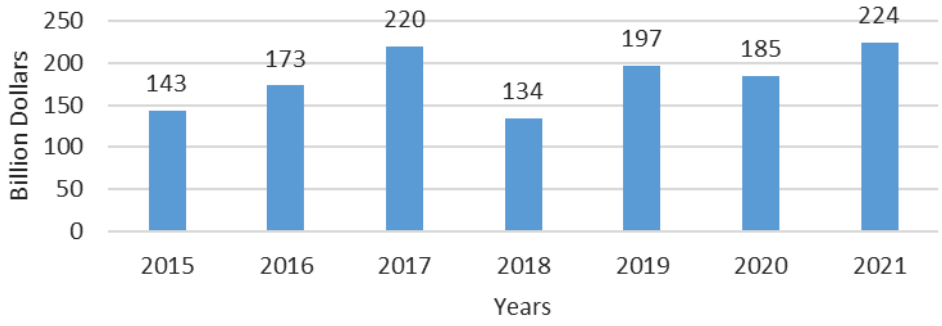
Introduction

In the 1970s, the Club of Rome identified population growth, food shortage, energy shortage, industry, and environmental problems as factors affecting the world's future in its "Growth Limits" report (Meadows et al., 1972). This led to the emergence of the concept of green finance, defined as the integration of the financial system with an environmentalist approach (Zengin & Aksoy, 2021). In simpler terms, green finance is a financial framework built on protecting the ecological environment (Whang & Zi, 2016), encompassing concepts such as green investment and green financing, collectively referred to as green finance (Chopra et al., 2005).

Green finance addresses environmental problems resulting from industrial development and is influenced by the global concern of climate change. The Paris Climate Agreement, reached after the United Nations Climate Change Conference of the Parties and endorsed by 196 countries, played a pivotal role in the widespread adoption of green finance practices (Soundarrajan & Vivek, 2021). Especially with the focus on climate change, green finance has become increasingly prevalent, catalyzing the transition of various sectors toward green practices (Ryszawska, 2016). The scope of green finance includes costs such as land and project preparation (Zadek & Flynn, 2013). It is emphasized that both the public and private sectors should implement green finance, as it not only updates infrastructure but also brings economic advantages, adds value, and creates sectoral benefits (Komşuoğlu, 2019; Soundarrajan & Vivek, 2016).

Figure 1 shows that the global size of green finance increased from $143 billion in 2015 to $224 billion in 2021, reflecting notable growth even after accounting for the impact of the pandemic. In 2021, Western Europe emerged as the dominant region in the distribution of green finance, comprising 77% of the total with $63.1 billion. South Asia followed with $5.5 billion. A study initiated by the European Union in March 2018 focused on creating green finance product labels and determining which products qualify as green finance. The aim of the study was to differentiate green finance practices from traditional financing methods, emphasizing standards and incentives (European Commission Initiative on Sustainable Finance, 2018). In Brazil, a guide law on the environment of financial institutions was published in 2014. This legislation aimed to define environmental risks by financial institutions and establish corporate governance structures to address these risks (Stuber, 2014).

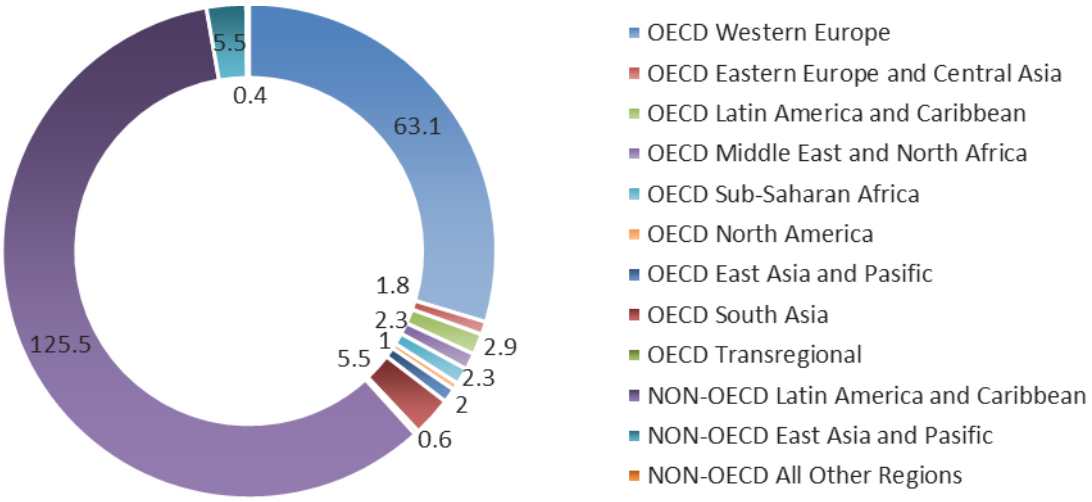
Figure 1: Green Finance



Source: https://idfc.org (Accessed: 16.11.2023).

Figure 2 shows climate finance commitments for the year 2021. While non-OECD countries had commitments of $102 billion in 2020, this increased to $131 billion in 2021. In OECD countries, commitments rose from $76 billion to $81 billion. The East Asia and Pacific region accounts for 60% of the 2021 commitments, totaling $125.5 billion, while Western Europe holds approximately 30% with $63.1 billion.

Figure 2: Climate Finance Commitments in 2021

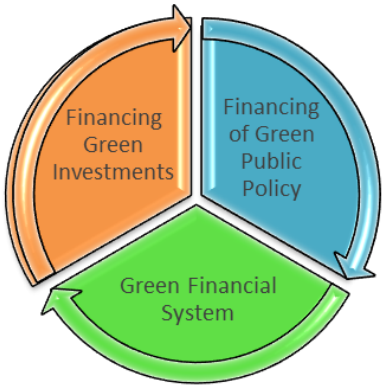


Source: idfc.org (Accessed: 16.11.2023).

The utilization of green finance products not only heightens environmental awareness but also amplifies environmental benefits (Cochu et al., 2013). These products serve as a source of prestige for both users and service providers, fostering a positive working environment for employees engaged in green finance services, leading to increased job satisfaction and efficiency (Cochu et al., 2013). Investors exhibit a preference for green finance due to ethical considerations and the desire to cultivate a positive image and reputation (Della Croce et al., 2011). Various financial instruments fall under the umbrella of green financial products, including green loans, green deposits, green bonds, green funds, green insurance products, green securities, and green infrastructure investments (Lindenberg, 2014; Soundarrajan & Vivek, 2016). Green loans specifically cater to financing projects aimed at resolving environmental issues (Güler & Tufan, 2015). Moreover, projects dedicated to environmental protection secure funding through instruments such as green sukuk or green bonds, along with similar financial tools like green funds (Kandır & Yakar, 2017; Ela, 2019; Sevim et al., 2018).

Green loans, recognized as a solution to environmental challenges by international financial institutions such as the World Bank (Volz et al., 2015), involve considering environmental impact in various investments. Users of green loans are obligated to allocate funds to projects addressing environmental issues (Gündoğan & Bitlis, 2018). Governments encourage financial institutions to adopt green finance practices, making green loans a pivotal financial tool for developing green economies (Xu & Li, 2020; Yan et al., 2016). In Figure 3, the components of green finance are illustrated, comprising green investments, green public policies, and the green financial system. Green bonds, which are utilized in financing environmentally friendly projects, are a key element. These bonds, initially issued by the World Bank in 2007 and later in Türkiye in 2016, are subject to the essential condition that the proceeds be used for green project purposes, monitored through evaluations by rating and audit companies (Jun et al., 2016; TSKB, 2016).

Figure 3: Green Finance



Source: Lindenberg, N. (2014). Definition of green finance. In Definition of Green Finance, Lindenberg, Nannette.

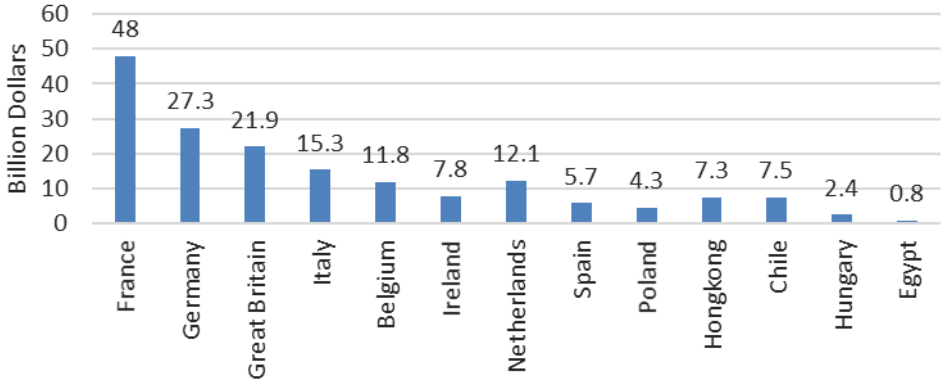
Transparency principles outlined in the Voluntary Process Guide of 2014 guide the issuance of green bonds, attracting institutional investors' attention (Zerbib, 2018). The Green Bond Principles, established by ICMA in 2017, encompass principles related to income use, project valuation, income management, and reporting (ICMA, 2017). China's Central Bank Green Bond Guide (2015) and the National Development and Reform Commission Green Bond Guide (2017) regulate green bond issuances in China, while the Association of Southeast Asian Nations introduced the Green Bond Principles in 2017 (Gündoğan & Bitlis, 2018; ASEAN GBS, 2017). In 2017, the Indian Securities and Exchanges Board issued a green bond guide, and Malaysia's Securities Commission set standards for green sukuk (Turguttopbaş, 2020). Hong Kong established the Green Certification System and Green Bond Grant System in 2018, ensuring compliance with the purpose of green finance pre- and post-issuance (GreenBond Grant Scheme, 2018). Factors such as green infrastructure costs, low green bond yields, and issuance costs impact the demand for green bonds, with these bonds exhibiting a negative issuance premium compared to traditional bonds in the market (Bakshi, 2015; Gianfrate & Pati, 2018). Although green bonds have higher spreads in secondary markets, their secondary market returns are also higher (Hirtenstein, 2017; Karpf & Mandel, 2017).

We see that the use of green bonds has increased, especially in 2021. It is understood from the figure that there has been a 4-fold increase in terms of both proportion and amount, especially in 2021, when more developed countries use green bonds compared to other years (Sakai et al., 2022).

Figure 4 shows that France preferred the green bond the most in the six-year period. In the period above, France was the country that made the most issuance with 48 billion dollars in the use of green bonds in the world. Germany followed France with 27.3 billion dollars and England with 21.9 billion dollars.

Between 2016 and 2021, the total usage of green bonds was as follows: Europe reached 161 billion dollars, Asia Pacific nine billion dollars, Western Hemisphere countries 8 billion dollars, the Middle East and Central Asia were below one billion dollars, and Africa was also below one billion dollars.

Figure 4: Distribution of Green Bond Usage in the World



Source: Sakai, A., Fu, C., Roch, F. & Wiriadinata, U. (2022). "Sovereign Climate Debt Instruments: An Overview of the Green and Catastrophe Bond Markets." IMF Staff Climate Note 2022/004, International Monetary Fund, Washington.

The emission volumes between 2017 and 2022 show that the European continent has the greenest bond issuance, followed by the Asia-Pacific continent (Wass et al., 2023).

Moreover, green loans serve as a means to transform industries (Hu et al., 2020), with commercial banks playing a crucial role as intermediaries in facilitating green loans to address environmental problems (Xing et al., 2020). In Türkiye, a private company extended the first green loan of $260 million for a wind power plant, with German investment banks providing funding, and four Turkish banks acting as guarantors and collateral representatives (Turguttopbaş, 2019). China extensively employs green credit as a green finance product (Zhou et al., 2020). Green Project Finance loans adhere to international standards, and loan pricing is evaluated by international credit rating agencies throughout the maturity period (Turseff1000, 2018). Green securitization, exemplified by the Hawaii Green Energy Market Securitization Program, allows investors to gain returns from environmentally sensitive assets and finance green technology through green bonds (Sakuda, 2015).

Management prioritizing environmental concerns serves as a catalyst, fostering investor confidence and encouraging investments in environmentally conscious stocks. This commitment to sustainable practices is frequently mirrored in indices that showcase eco-friendly businesses, such as the Luxembourg Green Index (LGX) (Turguttopbaş, 2020). Since the 2016 G-20 summit, green finance has gained prominence among central banks, financial system actors, and managers (Falcone, 2020). Banks, central banks, and governments have become integral to green financial systems, with the inclusion of green investment banks (OECD, 2016). The banking sector, acting as a financing source and implementing innovative green finance practices, plays a vital role in spreading green finance (Barbieri et al., 2016; Soundarrajan & Vivek, 2016). Green finance practices have been found to impact financial performance positively (Falcone et al., 2020) and contribute to the improvement of financial systems (Ghisetti & Quatraro, 2013). Nevertheless, the banking sector faces risks in allocating resources to green finance systems (Berensmann & Lindenberg, 2016).

Examining the relationship between green finance practices, financial ratios, profitability, and efficiency is considered beneficial (Komşuoğlu, 2019).

The banking sector plays a pivotal role in driving sustainable practices, and the increasing global emphasis on environmentally responsible financial initiatives has prompted a closer examination of green finance practices within the industry. In this context, our study seeks to investigate the factors influencing green finance practices among deposit banks operating in Türkiye from 2012 to 2021. The overarching goal is to discern whether these practices have a discernible impact on the profitability of the banks involved.

Our research question is "To what extent do various factors influence the adoption and implementation of green finance practices by deposit banks in Türkiye, and what is the nature of the relationship between green finance practices and the profitability of these banks?" The hypotheses of this study are:

H_1: There is a significant relationship between corporate governance indicators (YKBO, YKKO, YKDO, and YKKY) and the implementation of green finance practices in deposit banks.

H_2: Profitability indicators, namely Return on Assets (ROA) and Return on Equity (ROE), are positively associated with the adoption of green finance practices by deposit banks.

H_3: Banks with established green finance practices exhibit a higher degree of institutionalization compared to those without such practices, as indicated by corporate governance variables.

H_4: Control variables (FNKO and BYUK) do not significantly impact the relationship between green finance practices and bank profitability, serving as stable benchmarks in the analysis.

These hypotheses guide our exploration, aiming to provide insights into the determinants and consequences of green finance practices in the Turkish deposit banking sector. Through empirical analysis, we seek to contribute valuable knowledge to the ongoing discourse on sustainable financial practices in the global banking industry.

Conceptional framework and literature

Due to environmental degradation, the earth is facing the problem of accelerated melting of glaciers and polar ice caps. Therefore, natural phenomena such as wind, floods and heat waves have increased significantly (Zheng et al., 2021). These environmental problems, including ecological imbalances, biodiversity loss, land degradation, and ecological damage, are increasingly affecting the global economy and international politics (Liu et al., 2020). Developing countries are more vulnerable to the effects of climate change and depend heavily on global climate finance funding to protect and mitigate climate change. However, access to financial support is difficult for many countries due to limited institutional capacity in project design and planning (Ngwenya & Simatele, 2020). Every part of the world's economy deals with environmental problems and their impacts every day. Due to the growing dangers of climate change, the idea of green banking has recently received much attention in the green finance literature

(Chen et al., 2022). Given the growing international efforts to combat climate change, green finance (GF) has received much attention in the recent literature.

Its conceptual ambiguity prevents researchers from reaching a consensus on its significance (Zheng et al., 2021). Whang and Zi (2016) looked at the position that the general public should adopt regarding green finance under the current market circumstances. Gülcan (2017) used the financial ratios of the BIST 50 companies in his research to investigate the connection between green financial management and financial indicators. Güler and Tufan (2015) looked at the connection between financial ratios and the use of green credit. They noted the benefits of green finance. Bangladesh was the focus of Lalon's (2015) research on green financial products. Gizep (2019) similarly looked at green financial assets. Based on Türkiye and the rest of the globe, Kandır and Yakar (2017) discussed green bonds. Green finance was described and its connection to the banking industry was outlined in a study performed in India by Soundarrajan and Vivek (2016). According to Antonietti and Marzucchi's (2014) research, green fixed-asset investments made by Italian businesses positively impact business performance. The research by Falcone (2020) looked at how green finance can help with investments in and changes to the environment. The research done by Mahalleolu (2019) provides details on green finance methods. The research done by Turguttopbaş (2020) explains how green finance developed and how it is used. On the other hand, Zengin and Aksoy's research from 2021 explains the connection between green marketing and green finance. The paper by Soundarrajan and Vivek (2016) explains the development of green finance in India. Green credit policies and green finance practices were examined in China by Zhang et al. (2021) using the difference in differences (DID) analysis approach. The analysis's findings revealed the advantages of green finance applications but found no change in green credit policies. Ning and She (2014) discovered that green loans harm economic development in their study. Zhang (2021) found that this financing strategy was expensive despite mentioning the necessity of green credit arrangements for environmentally friendly output. Afridi et al. (2021) claim that green loans are a less risky investment due to their examination of 24 Pakistani banks functioning from 2009 to 2015. Managers seeking to increase their business loans and lower the risk of default will also find the results helpful. According to their results, banks should invest more in green initiatives. Zheng et al. (2021) examined the major obstacles to green finance's implementation in Bangladesh and looked into how bankers perceived various aspects of green finance. When compared to other financial institutions, both banks and non-bank entities, the findings of the study reveal that private commercial banks play the most significant role in advancing green finance in Bangladesh. They account for a substantial 74.2% share of the total green finance in the country. Green finance applications are mentioned and their applicability in Türkiye is looked at in the research by Kuloğlu and Öncel (2015). In the study conducted by Najaf and Najaf (2021), it was determined that green finance practices in Malaysia have positive and negative effects on financial performance. In Yu et al. (2021), the incentives for green finance, the green finance practices of businesses in China between 2001 and 2017, and the regulatory bodies' perspectives on green finance are all included. Şimşek and Tunal (2022) looked at the evolution of green finance, the products that fall under it, and their current state. The study by Du et al. (2022) emphasized the relationship between China's green finance policies and green companies. It was determined that China should offer more supportive policies. In addition, it has been determined that there is a relationship between green finance and financial performance. Chen et al. (2022) looked into how Bangladeshi private commercial banks' green banking practices affected their environmental performance and found sources of green funding. The investigation discovered that green banking practices significantly enhance green finance. Additionally, the environmental performance of banks is strongly and favorably impacted by banks' green initiative financing.

This paper addresses a significant gap in the existing literature by examining the factors that influenced the green financing practices of Turkish depository banks between 2012 and 2021 and investigating the potential impact of these practices on profitability. Despite the growing literature on sustainable finance and corporate practices, there is little research specifically focused on the Turkish banking sector. This study adds to the literature by using annual data from Turkish deposit banks and applying backward logistic regression analysis to identify variables that influence green financing practices. This approach allows for a nuanced understanding of the ideal model and provides insight into the institutionalization of banks' adoption of green financial applications by incorporating variables related to corporate governance. In addition, the inclusion of control variables increases the robustness of the study. By filling this gap, this paper not only enriches the knowledge of sustainable finance, but also provides practical insights for policymakers, practitioners and academics interested in moving towards greener and more profitable practices in the Turkish banking sector. The results of this study provide a valuable contribution to the ongoing discussion on green finance and sustainability in the banking sector.

Data and methodology

The study conducted an analysis on the annual data of deposit banks in Türkiye from 2012 to 2021, utilizing information obtained from the Public Disclosure Platform via the banks' websites. The selection of variables was guided by existing literature, and the research, encompassing deposit banks listed by the Turkish Banking Regulation and Supervision Agency, aimed to discern the factors influencing green finance practices of these banks during the specified period, as well as exploring the potential impact of such practices on their profitability. To identify the variables affecting green finance practices, the research employed backward logistic regression analysis. This analytical approach involves including all variables in the analysis and systematically eliminating them step by step, ultimately facilitating the identification of an ideal model.

Backward logistic regression analysis was chosen for several reasons. First, our study includes an investigation of several possible variables that may affect the green financing practices of Turkish depository banks over a period of time. Backward logistic regression analysis provides an efficient mechanism for handling a large number of variables and helps us identify the most relevant factors by systematically eliminating those variables that do not have a significant effect in the model. Furthermore, given the exploratory nature of our research question and the lack of a predetermined set of variables, backward logistic regression analysis met our goal of stepwise model refinement. This approach allows us to uncover key determinants of green financing practices that may not be apparent in the initial analysis stages.

Table 1 outlines the variables used in the analysis, encompassing profitability rates (ROA and ROE) and green finance applications as both dependent and independent variables in the YEFN analysis. Additionally, corporate governance-related variables (YKBO, YKKO, YKDO, and YKKY) were included to examine the hypothesis that banks implementing green finance practices might be more institutionalized. Other financial ratios (FGTV, KRTV, MDTV, MVTV, NATV, NTKR, OZTV, and TFTV) are included in the analysis as performance indicators believed to potentially impact green finance. Control variables, FNKO and BYUK, were also integrated into the study. The data and methodology employed in this research contribute to a comprehensive exploration of the factors influencing green finance practices in Türkiye's deposit banks, shedding light on their potential impact on profitability.

Table 1: Variable List

Variable Type	Abbreviations	Definition
Independent Variable	BYUK	Company Size
Independent Variable	FGTV	The ratio of Interest Income to Total Assets
Independent Variable	FNKO	Financial Leverage Ratio
Independent Variable	KRTV	The ratio of Loans and Receivables to Total Assets
Independent Variable	MDTV	The ratio of Tangible Fixed Assets to Total Assets
Independent Variable	MVTV	The ratio of Deposit to Total Assets
Independent Variable	NATV	Ratio of Cash and Equivalents to Total Assets
Independent Variable	NTKR	Net Profit for the Period
Independent Variable	OZTV	The ratio of Equity to Total Assets
Dependent Variable	ROA	Return on Assets Ratio
Dependent Variable	ROE	Return on Equity Ratio
Independent Variable	TECR	Company Age
Independent Variable	TFTV	Ratio of Derivative Financial Assets to Total Assets
Dependent Variable	YEFN	Status of Using Green Finance Applications
Independent Variable	YKBO	Board of Directors Independence Rate
Independent Variable	YKDO	The ratio of the Number of Audit Committee Members to the Number of Board Members
Independent Variable	YKKO	Ratio of Female Members of the Board of Directors

Source: Author's own work.

Table 2 contains the descriptive statistics of the variables included in the analysis. In the period covering the years 2012-2021, it is observed that the cash and equivalents of 26 deposit banks was around 18% on average. In addition, it is understood that the ratio of derivative financial assets is around 1%. It is understood from the table that loans and receivables were realized as approximately 55% in the said process. In the same period, the ratio of tangible fixed assets is around 10%.

On the other hand, the average deposit was 58%, and the shareholders' equity was approximately 15%. In this process, banks have profited approximately 1.5 billion TL. Return on assets was 1.3% and return on equity was around 7%. The interest income ratio to assets had an average value of around 9%. In line with this information, it is understood that the asset sizes of deposit banks have developed at a greater rate than their profitability. On the other hand, it is understood from the findings that the conversion ratio of deposits to loans is almost one.

Table 2 shows that between 2012-2021, the independence rate of the board of directors of deposit banks was around 8%, and the rate of female members in the board of directors was around 17%. In light of this information, it is understood that deposit banks have developed in terms of the independence of the board of directors, which is one of the dimensions of corporate governance.

Table 2: Descriptive Statistics

Variables	Observation	Smallest	Largest	Mean	Standard Deviation
NATV	260	0.0000	0.9160	0.179307	0.1525971
TFTV	260	0.0000	0.0758	0.011259	0.0154977
KRTV	260	0.0000	0.8258	0.549531	0.2002117
MDVT	260	0.0000	0.0594	0.010244	0.0088324
MVTV	260	0.0009	0.8220	0.580546	0.1605204
OZTV	260	0.0288	0.9281	0.151508	0.1649435
NTKR	260	-767847.0000	13541060.0000	1537478.290000	2459748.4040000
ROE	260	-3.9858	0.3101	0.072508	0.2709392
ROA	260	-0.1282	0.1609	0.013145	0.0262095
BYUK	260	5.0193	9.1742	7.442458	0.9507261
FGTV	260	0.0001	0.4562	0.086314	0.0482112
YKBO	260	0.0000	0.4286	0.080189	0.1334671
YKKO	260	0.0000	1.0000	0.170995	0.1544014
YKDO	260	0.1429	1.0000	0.268501	0.0856402
YKKY	260	0.0000	1.0000	0.390297	0.2493297
TECR	260	1.0000	0.1580	43.080000	34.8540000
FNKO	260	0.0719	0.9712	0.848488	0.1649423
YEFN	260	0.0000	1.0000	0.240000	0.4270000

Source: Author's own work.

When logistic regression is expressed mathematically, the probability is based on odds and logarithms of odds. The odds concept is the ratio of the probability of occurrence of an event to the probability of it not happening (Mertler & Vannatta, 2005).

$$Odds = \frac{p(x)}{1-p(x)} \quad (1)$$

Logistic regression aims to maximize the probability of an event occurring (Hair et al., 2006). While the odds ratio is usually denoted by β, the logit is calculated by taking the natural logarithm of the odds ratio (Mertler & Vannatta, 2005).

$$Yi = \frac{e^u}{1+e^u} \quad (2)$$

Yi: The probability that the ith variable is included in one of the dependent variable categories.
e: is a constant number equal to the value 2.718.
u: is the regression equation u = B0 + B1 X1 + …..+ Bi Xi.

As a result, logistic regression analysis takes the following form with linear regression analysis creating the logit of odds ratio (Tabachnick & Fidell, 1996):

$$\ln\left(\frac{Y}{1-Y}\right) = \beta_0 + \beta_1 X_1 + \ldots + \beta_i X_i \quad (3)$$

The study's primary aim is to determine the financial statement information and corporate governance factors that affect green finance practices. For this reason, a function was created that shows the relationship between the prepared variables and green finance.

The function created to determine the variables affecting green finance practices is given below:

$$\begin{aligned} YEFN = {} & \beta_0 + \beta_1 NATV + \beta_2 TFTV + \beta_3 KRTV \\ & + \beta_4 MDVT + \beta_5 MVTV + \beta_6 OZTV + \beta_7 NTKR \\ & + \beta_8 ROE + \beta_9 ROA + \beta_{10} BYUK + \beta_{11} FGTV \\ & + \beta_{12} YKBO + \beta_{13} YKKO + \beta_{14} YKKY + \beta_{15} TECR \\ & + \beta_{16} FNKO + \varepsilon \end{aligned} \quad (4)$$

In order to determine the variables affecting green finance applications, the analysis was carried out with the backward stepwise logistic regression model. Since the dependent variable, YEFN, was a categorical variable, performing a logistic regression analysis was deemed appropriate. The backward stepwise logistic regression model was preferred to include all the variables in the analysis and eliminate those that did not contribute significantly to the model. According to the classification table in Table 3, it is understood that the variables in the model are classified correctly at a rate of 86%.

Table 3: Classification Table

Observed			Estimated		
			YEFN		Total Percentage
			0	1	
Step	YEFN	0	198	0	100.0
		1	62	0	0.0
	Verification Percentage				86.2

Source: Author's own work.

Table 4 includes the Omnibus Test, which calculates the significance level of the chi-square statistic for step, block, and model. This test shows the improvement in the model as the variables are removed at each step. According to Table 4, the significance value of the model was less than 0.05 in each step and the seventh step, which is the last step, and it is seen that the extracted variables contributed significantly to the model.

Table 4: Omnibus Test

		chi-square	Difference	p - value
Step 1	Step	168.844	16	0.000
	Blok	168.844	16	0.000
	Model	168.844	16	0.000
Step 2[a]	Step	0.000	1	0.992
	Blok	168.843	15	0.000
	Model	168.843	15	0.000
Step 3[a]	Step	-0.271	1	0.603
	Blok	168.573	14	0.000
	Model	168.573	14	0.000
Step 4[a]	Step	-0.994	1	0.319
	Blok	167.579	13	0.000
	Model	167.579	13	0.000
Step 5[a]	Step	-0.967	1	0.326
	Blok	166.612	12	0.000
	Model	166.612	12	0.000
Step 6[a]	Step	-0.905	1	0.341
	Blok	165.707	11	0.000
	Model	165.707	11	0.000
Step 7[a]	Step	-1.887	1	0.170
	Blok	163.820	10	0.000
	Model	163.820	10	0.000

Source: Author's own work.

Table 5 includes the model summary table. -2LL in this table is a model fit index (Hair et al., 2006); In the backward stepwise model it shows that a near-perfect fit is obtained as we move away from zero. According to Table 5, the -2 Loglikelihood number is constantly increasing and reaches -2LL 121,816 in the last step, showing that the variables in the model significantly contribute to the model. In addition, the Nagelkerke R2 and Cox & Snell R2 values in Table 5 show the amount of variance explained by the logistic model (Field, 2005), and 1.00 corresponds to a perfect model fit. Since the Cox & Snell R2 value never reaches 1.00,

Nagelkerke R2 models, the modified form of Cox & Snell R2, are preferable to explain (Mulluk, 1386). In the seventh step, Nagelkerke R2 was 0.701, and Cox & Snell R2 was 0.467. Accordingly, in the last step, it is understood that the compatibility of the variables in the model with the model is 70.1%.

Table 5: Model Summary

Step	-2 Log likelihood	Cox & Snell R2	Nagelkerke R2
1	116.793[a]	0.478	0.716
2	116.793[b]	0.478	0.716
3	117.063[a]	0.477	0.716
4	118.057[a]	0.475	0.713
5	119.024[a]	0.473	0.710
6	119.929[b]	0.471	0.707
7	121.816[a]	0.467	0.701

Source: Author's own work.

The Hosmer and Lemeshow test in Table 6 is a chi-square goodness-of-fit test and shows the fit of the logistic regression model as a whole. For the result of the Hosmer and Lemeshow test to be meaningful, the required significance value must be greater than 0.05. According to Table 6, it is understood that the significance value of the Hosmer and Lemeshow test is more significant than 0.05 at each step and the last step, and therefore the model is compatible.

Table 6: Hosmer and Lemeshow Test

Step	chi-square	Difference	p - value
1	5.600	8	0.692
2	5.592	8	0.693
3	5.593	8	0.693
4	3.179	8	0.923
5	2.401	8	0.966
6	1.966	8	0.982
7	1.701	8	0.989

Source: Author's own work.

Table 7 shows the variables in the last step of the logistic regression analysis. Accordingly, the coefficients, standard errors, significance status, and Exp(B) (odds) numbers of the variables in the final version of the model are given. In the last step, it is understood that TFTV, KRTV, MDVT, OZTV, BYUK, YKKO, YKDO, YKKY, and TECR variables significantly affect the model. If the Exp(B) coefficient is greater than 1, it indicates a positive relationship, and if it is less than 1, it indicates a negative relationship (Hair et al., 2006). In line with this information, the variables TFTV, KRTV, OZTV, YKDO, YKKY, and TECR are in a negative relationship with green financing, while the variables MDVT, OZTV, BYUK, and YKKO are in a positive relationship. The model formed in this case is given below.

$$YEFN = \beta_0 + \beta_1 TFTV + \beta_2 KRTV + \beta_3 MDVT + \beta_4 OZTV + \beta_5 BYUK + \beta_6 YKKO + \beta_7 YKDO + \beta_8 YKKY + \beta_9 TECR + \varepsilon \quad (5)$$

Table 7: Last step Table of Variables

		Coefficient	Standard Error	Wald (odds)	Difference	p - value	Exp(B)
Step 7[a]	TFTV	-63.634	19.743	10.388	1	0.001	0.000
	KRTV	-17.284	4.394	15.475	1	0.000	0.000
	MDVT	302.033	59.394	25.860	1	0.000	1.484E+131
	MVTV	5.949	3.064	3.771	1	0.052	383.421
	OZTV	-43.386	11.991	13.091	1	0.000	0.000
	BYUK	6.244	1.096	32.463	1	0.000	514.851
	YKKO	7.474	2.354	10.080	1	0.001	1761.468
	YKDO	-12.088	4.327	7.806	1	0.005	0.000

		Coefficient	Standard Error	Wald (odds)	Difference	p - value	Exp(B)
Step 7[a]	YKKY	-4.460	1.790	6.209	1	0.013	0.012
	TECR	-0.053	0.013	17.662	1	0.000	0.949
	c	-35.724	7.135	25.066	1	0.000	0.000

Source: Author's own work.

The objective of this study is to investigate the potential impact of green finance practices on financial performance. To assess this relationship, panel data regression analysis was employed to examine the association between green finance applications and both return on assets (ROA) and return on equity (ROE) ratios. Initially, the analysis focused on determining the correlation between the return on assets ratio and green finance applications. To determine the most suitable model for panel data analysis, the Hausman test was conducted as an efficiency test. The Hausman test aids in choosing between the fixed effects model and the random effects model, guiding researchers toward the more efficient model (Çelik & Kıral, 2020). In this study, the random effects model was selected, as indicated by the Hausman test results in Table 8, where the test value of 0.3558 exceeded the critical value of 0.05.

Table 8: Return on Assets Ratio Panel Data Regression Analysis Hausman Test

Variables	Fixed Effects	Random Effects	Difference
YEFN	-0.0002673	-0.0023611	0.0020938
NATV	0.0388021	0.0231551	0.0156470
TFTV	-0.0915722	-0.1797585	0.0881764
KRTV	-0.0093465	-0.0080659	-0.0012806
MDVT	-0.0768573	-0.1437685	0.0669111
MVTV	0.0252167	0.0248859	0.0003309
OZTV	-5.5146270	-9.4555260	3.9408980
NTKR	3.3700000	3.0800000	3.0600000
ROE	0.0409555	0.0423158	-0.0013603
BYUK	0.0084333	0.0086215	-0.0001882
FGTV	0.1406073	0.1385026	0.0021047
YKBO	-0.0084618	-0.0082451	-0.0002167
YKKO	0.0078788	0.0067746	0.0011042
YKDO	0.0298353	0.0245563	0.0052789
YKKY	0.0138097	0.0129832	0.0008265
TECR	-0.0000600	-0.0000620	2.0000000
FNKO	-5.5930050	-9.5415290	3.9485240
Prob > chi2		0.3558	

Source: Author's own work.

The panel data regression analysis random effects model is mathematically illustrated below (Hedges, 1983):

$$Y_{it} = \alpha_1 + \beta_{1it} X_{1it} + \beta_{2it} X_{2it} + ... + \beta_{mit} X_{mit} + w_{it} \quad (6)$$

Y_{it}: Combination of the predictor variable with the time series
i: section unit
t: time unit
α_1: average constant
w_{it}: Combination of the time series and the standard error term of the cross-section

Table 9 shows the random effects model of the panel data regression analysis, which was carried out to determine whether the return on assets ratio is affected by green finance applications. According to the Hausman test result, according to the preferred random effects model, a statistically significant relationship could not be determined between the return on assets and green finance applications. As a result of the analysis, it was determined that there is a statistically significant relationship between return on assets and NATV, TFTV, MVTV, ROE, BYUK, FGTV, YKKY.

Table 9: Return on Assets Ratio Panel Data Regression Analysis Random Effects Model

ROA	Coefficient	Standard Error	p - value
YEFN	-0.0023611	0.0023988	0.325
NATV	0.0231551	0.0066162	0.000
TFTV	-0.1797585	0.0648391	0.006
KRTV	-0.0080659	0.0082182	0.326
MDVT	-0.1437685	0.1087787	0.186
MVTV	0.0248859	0.0072309	0.001
OZTV	-9.4555260	20.1289000	0.639
NTKR	3.0800000	6.0800000	0.960
ROE	0.0423158	0.0030915	0.000
BYUK	0.0086215	0.0021605	0.000
FGTV	0.1385026	0.0204591	0.000
YKBO	-0.0082451	0.0064506	0.201
YKKO	0.0067746	0.0074280	0.362
YKDO	0.0245563	0.0109520	0.025
YKKY	0.0129832	0.0448460	0.004
TECR	-0.0000620	0.0000393	0.115
FNKO	-9.5415290	20.1289600	0.635
Sabit	9.4427730	20.1278900	0.639
Prob > chi2		0.000	

Source: Author's own work.

The return on equity ratio panel data regression analysis Hausman Test is included in Table 10. Since the Hausman test value was more significant than 0.05, applying the random effects model was preferred.

Table 10: Return on Equity Ratio Panel Data Regression Analysis Hausman Test

Variables	Fixed Effects	Random Effects	Difference
YEFN	-0.0172323	-0.0058856	-0.0113467
NATV	-0.2275448	-0.1696584	-0.0578864
TFTV	1.8489770	2.3669410	-0.5179643
KRTV	0.1010179	0.0988148	0.0022032
MDVT	0.7867675	0.3841349	0.4026326
MVTV	-0.2763002	-0.2882652	0.0119650
OZTV	161.3474000	160.8918000	0.4556449
NTKR	-5.5600000	-2.9000000	-2.6600000
ROA	10.3792900	10.3122300	0.0670597
BYUK	-0.0096898	-0.0177593	0.0080695
FGTV	-1.8273360	-1.7992170	-0.0281194
YKBO	0.0849575	0.0924365	-0.0074790
YKKO	-0.0835071	-0.0836111	0.0001039
YKDO	-0.6356395	-0.6205971	-0.0150425
YKKY	-144.7010000	-0.1298381	-0.0148629
TECR	0.0002022	0.0002471	-0.0000449
FNKO	161.8523000	161.4399000	0.4124228
Prob > chi2		0.8671	

Source: Author's own work.

Table 11 shows the return on equity ratio panel data regression analysis random effects model. The analysis found no statistically significant relationship between the return on equity ratio and green finance practices. On the other hand, a statistically significant relationship was found between return on equity and TFTV, MVTV, ROA, FGTV and YKNR.

Table 11: Return on Equity Ratio Panel Data Regression Analysis Random Effects Model

ROE	Coefficient	Standard Error	p - value
YEFN	-0.0058856	0.0375207	0.875
NATV	-0.1696584	0.1053024	0.107
TFTV	2.3669410	1.0168170	0.020
KRTV	0.0988148	0.1283907	0.442
MDVT	0.3841349	1.7040610	0.822
MVTV	-0.2882652	0.1141150	0.012
OZTV	160.8918000	314.2013000	0.609
NTKR	-2.9000000	9.4800000	0.760
ROA	10.3122300	0.7533801	0.000
BYUK	-0.0177593	0.0348002	0.610
FGTV	-1.7992170	0.3285516	0.000
YKBO	0.0924365	0.1008633	0.359
YKKO	-0.0836111	0.1160321	0.471
YKDO	-0.6205971	0.1680670	0.000
YKKY	-0.1298381	0.0707186	0.066
TECR	0.0002471	0.0006166	0.689
FNKO	161.4399000	314.2037000	0.607
C	-160.7995000	314.1853000	0.609
Prob > chi2		0.000	

Source: Author's own work.

Conclusions

In December 2015, nations globally committed to formulating national climate targets at the Paris Climate Summit (COP21), emphasizing the need for urgent and substantial investment projects to achieve these goals (COP21). Despite this, many national climate action plans lack explicit emission reduction targets for financial institutions such as banks and trusts, which play a crucial role in mobilizing private capital and managing carbon risk (Schaefer, 2017). International bodies, including G7 and G20 working groups, often leverage the concept of "green finance" for these purposes (Schaefer, 2017). The term "green finance" has gained scholarly attention due to the increasing global focus on addressing climate change, although a consensus definition remains elusive (Zheng, 2021). Central banks and financial regulators engage with green finance to maintain macroeconomic and financial stability, considering the risks posed to households, businesses, and financial intermediaries by climate change (Zheng, 2021). However, modeling these risks on the financial system is challenging due to their complex and interconnected nature, surpassing the historical data's scope. Conversely, the global move towards economic decarbonization offers numerous investment opportunities, prompting central banks and supervisors to redirect financial support from traditional, environmentally harmful industries to the emerging green economy (Breitenfellner et al., 2019). While the public sector holds primary responsibility for climate action, private commercial banks have a unique position to either support or divert funding towards green investments. This study, focusing on six commercial banks, explores their practices in fostering green business ventures, emphasizing the prerequisites and challenges faced by domestic and foreign commercial banks in Türkiye (Breitenfellner et al., 2019). The research contributes to the literature by addressing the role of commercial banks in facilitating green finance and highlighting ongoing efforts of Turkish commercial banks in this area. Green finance practices involve financial policies prioritizing environmentally-oriented solutions, with factors affecting these practices including derivative financial assets, loans, tangible assets, equity, company size, gender diversity on the board of directors, audit committee, and company experience. Deposit banks' assets can be shaped within the framework of green finance, incorporating practices such as green buildings, loans, and bonds, while corporate governance, particularly the independence of the board of directors, influences these practices (Soundarrajan & Vivek, 2016; Zheng et al., 2021). However, no statistically significant relationship was found between return on assets and return on equity ratios, commonly used to measure company performance, and green finance practices. This suggests that there is no direct link between company performance and green finance practices, contrary to some findings in the literature (Gülcan, 2017; Güler & Tufan, 2015; Du et al., 2022; Xiliang et al., 2022). In conclusion, this study indicates that green finance practices in deposit banks are influenced by financial statements and corporate governance, but not necessarily

ments and corporate governance, but not necessarily linked to profitability. It suggests that deposit banks implementing green finance practices prioritize environmental concerns in their financial policies, and further research across different sectors may yield different results.

In Türkiye, the emergence of concepts such as climate change and green finance on the agenda of regulatory authorities after 2021, the absence of legal obligations such as a climate law, and the lack of direct sanctions for carbon-zero practices in industry and individual consumption contribute to banks playing a more prominent role in green energy financing. The fact that there are no direct sanctions for carbon-zero practices in industry and among individual consumers also hinders the diversification of banking products in the field of green finance. Therefore, the results obtained from the study currently meet the expectations for Türkiye. It is believed that the widespread adoption of green finance and the consequent transformation of banking products will occur in the banking sector, positively impacting its profitability, either after the enforcement of legal obligations like the climate law or as a result of the continuation of the current trend in the coming years.

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