The Relationship between Fintech and Sustainable Investment Performance

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Abstract: The aim of this study is to investigate the impact of fintech applications on sustainable investment performance in Türkiye. With the widespread adoption of fintech technologies, the digitalization of financial services has introduced a new paradigm in terms of both economic efficiency and sustainability. In this context, the number of internet banking users is considered as an indicator of fintech, while CO_2 emissions are used as an indicator of environmental sustainability. A simple linear regression analysis was conducted using quarterly data from the period between 2016 and 2024. The research findings indicate a significant and negative relationship between the increase in internet banking usage and the level of carbon emissions. This result reveals that digital banking solutions not only enhance financial inclusion but also contribute to environmental sustainability by reducing the consumption of physical resources.

Keyword: Fintech, Sustainable Investment, CO_2 Emissions, Digital Banking, Regression Analysis

JEL Classification: L82

1. Introduction

The rapid pace of digital transformation on a global scale has brought about fundamental changes in financial systems. In particular, financial technologies (Fintech) have reshaped the delivery of traditional financial services, making access to financial transactions easier for both individuals and institutions. Fintech applications encompass a wide range of technologies such as payment systems, investment advisory services, digital wallets, open banking, and blockchain, rendering financial services faster, more transparent, and more inclusive (Gülbaşı & Karahan, 2023).

The innovations introduced by fintech are not limited to technological dimensions; they also facilitate the integration of environmental, social, and governance (ESG) responsibilities into investment processes. Nowadays, investors prefer financial instruments that not only offer high returns but also contribute to sustainable values. ESG criteria (Environmental, Social, Governance)

provide a crucial framework in this regard. Fintech solutions facilitate access to ESG-based investments and enable investors to manage sustainable portfolios (Kaymak, 2019).

The integration of technologies such as artificial intelligence, big data analytics, and blockchain into financial systems allows investment decisions to be made more consciously, data-driven, and effectively. Thanks to these technologies, investors can easily identify companies with high ESG scores, monitor environmental impacts such as carbon footprints, and measure sustainability performance in real-time (Özdemir, 2023). Thus, fintech plays a critical role in making sustainable investments more accessible and manageable.

2. Literature Review

Canikli (2023) investigates the role of fintech in achieving sustainable development goals. The study emphasizes that financial technologies, especially in developing countries, can serve as important tools for financing sustainable projects. It is noted that fintech applications enable more efficient use of financial resources in combating climate change and addressing environmental problems.

Soytaş, Denizel, Durak Uşar, and Ersoy (2017) analyzed the effect of sustainability performance on the financial performance of Turkish firms. Their analysis, based on data from 214 firms, revealed a positive and significant impact of sustainability performance on financial performance. Additionally, it was found that foreign-partnered companies were in a more advantageous position compared to domestic firms in terms of both sustainability and financial performance.
Akpınar Kılıç (2025) examined the evolution of the sustainable finance and fintech literature between 2010 and 2024 using bibliometric analysis. The study shows that these two fields are increasingly integrated, with topics such as green finance, digital payment systems, and blockchain technology gaining prominence. It highlights research trends and collaborations in the fields of sustainable finance and fintech.

The fintech sector has become a key area that has transformed traditional banking systems and created new opportunities for sustainable investment. Belli (2014) examined the impact of fintech on the banking sector and highlighted its potential to enhance efficiency and improve customer service in traditional banks. The study discusses how financial hubs like Istanbul can benefit from London's fintech ecosystem and how this can reshape local banking sectors.

Xu, Nassani, Abro, Naseem, and Zaman (2024) explored the link between fintech adoption and sustainable resource utilization in the context of Industry 4.0. Their study examines the impact of

fintech on renewable energy consumption and carbon emissions, highlighting its potential to promote sustainable finance and its implications for environmental sustainability.

Müller and Reuter (2020) investigated how fintech and green finance can be aligned with the United Nations Sustainable Development Goals (SDGs). The study emphasizes the catalytic role that fintech applications can play in achieving SDGs, particularly by supporting the digitalization of green investments.

3. The Concept and Development of Fintech

Definition and Characteristics of Fintech

Fintech is a term derived from the combination of "financial" and "technology" and refers to the digitalization of financial services through technology-based innovations. The fintech sector transfers traditional financial activities such as investment, banking, insurance, and payment systems to digital platforms. This allows users to access these services faster, at lower costs, and more conveniently (Arner, Barberis & Buckley, 2016).

By pushing the boundaries of the traditional financial system and reshaping it, fintech aims to make financial services more efficient, inclusive, and user-friendly through technology. This transformation has progressed gradually and structurally over time.
Major Technological Innovations in the Fintech Field

Blockchain and Smart Contracts

Blockchain technology enables transactions to be recorded securely and immutably through its decentralized structure (Öz & Alyürük, 2020). This technology reduces the need for intermediaries in financial transactions, thereby lowering costs and increasing transaction speed (Yli-Huumo, Ko, Choi, Park & Smolander, 2016).

Crowdfunding and P2P Systems

Crowdfunding occurs when initiatives or projects receive small-scale financial support from a broad group of investors, usually over the internet. It provides an important source of financing for early-stage ventures (Şendur, 2018).

Peer-to-peer (P2P) lending systems allow investors to provide credit directly to borrowers. These systems serve as an effective alternative to traditional banking finance, with credit evaluation processes automated through digital technologies.

Robo-Advisors and AI-Based Systems

Robo-advisors are digital platforms that generate portfolio recommendations based on the investor's goals and risk profile using algorithms. These platforms are more cost-effective and faster than traditional advisory services (Siber Mega, 2024). In this process, artificial intelligence plays an active role in risk management, data analysis, and portfolio recommendations. With the help of big data analytics and machine learning techniques, robo-advisors provide investors with personalized financial recommendations (Topuzoğlu & Çevik Tekin, 2024).

Fintech's Impact on the Financial System

Fintech applications such as mobile banking, digital wallets, and alternative credit assessment methods aim to enhance financial inclusion by enabling individuals and small businesses with limited access to financial services to participate in the system (Price, 2024).

Fintech has transformed the structure of the financial system, reshaping traditional banking practices and financial intermediation processes. Mobile banking, digital payment systems, and blockchain-based technologies increase transaction speed and reduce costs. As a result, access to financial services becomes easier, and the system becomes more competitive and user-centered (Petralia, Philippon, Rice & Veron, 2019).

Fintech solutions enhance transparency in the financial system and reduce information asymmetry, enabling more data-driven decision-making processes. User behavior is analyzed instantly through digital platforms, and the results are used to personalize financial products (Rerung, Paranita, Ay & Salamah, 2024).

4. Sustainable Investment

Sustainable investment is an approach that aims to create long-term value by integrating environmental, social, and governance (ESG) factors into the investment decision-making process. Unlike traditional investment models that focus solely on financial returns, this approach also considers the social and environmental impacts of investments (European Environment Agency, 2018).

Sustainable investment markets have become one of the fastest-growing segments of the global financial sector. ESG-based investments stand out not only for their environmentally friendly strategies but also for their long-term risk management perspectives. As of 2023, the global ESG investment market is estimated to be worth approximately $30 trillion USD, with expectations to exceed $50 trillion by 2030 (Morningstar, 2023). Sustainable investments incorporate ESG factors into investment processes, allowing investors to prioritize not only financial returns but also social and environmental impact. Compared to traditional investments, these strategies may display different risk and return profiles (Lashgari, 2024).

Financial Effects of ESG Performance

Environmental, Social, and Governance (ESG) criteria are core indicators for evaluating companies' sustainability performance. In recent years, empirical evidence has shown that ESG goes beyond enhancing corporate reputation and is significantly associated with financial performance. Companies aligned with ESG standards are generally perceived as lower-risk and have greater potential for long-term value creation in the eyes of investors (Aslan Çetin, Öztürk & Akarsu, 2024).

A recent study from China contributing to the global literature found that environmental and governance performance positively affect corporate profitability, while the social dimension had no statistically significant impact (Xu & Zhu, 2024). This indicates that the three ESG dimensions do not influence financial performance equally, and their strategic weight may vary.

However, the financial impact of ESG is not always positive. For instance, a study by Şeker and Güngör (2022) on companies operating in the electricity, water, gas, and waste sectors in Türkiye found no statistically significant relationship between ESG scores and financial performance. This highlights the sector-specific sensitivity of ESG investment outcomes.

In conclusion, the financial implications of ESG performance are multidimensional. The degree of impact depends on the sector in which the company operates, the scope of the ESG strategy it implements, and market dynamics. Nevertheless, current research supports that ESG investments contribute to financial stability and performance, particularly in the long term.

5. The Intersection of Fintech and Sustainable Investments

Financial technologies (fintech) have sparked a profound transformation in the financial sector in recent years, enabling the digitalization of financial services and expanding access to wider

audiences. This transformation is significant not only in terms of operational convenience and speed but also in enabling investment decisions to be more conscious, transparent, and rooted in sustainability. The concept of sustainable investment represents an approach that incorporates environmental, social, and governance (ESG) criteria, and fintech solutions make it easier to measure, evaluate, and integrate these criteria into investment processes (Çabaş, 2024).

Blockchain technology, one of the most powerful tools offered by fintech, enhances transparency and trust in financial transactions. Particularly in supply chain management, the traceability of product origins ensures compliance with environmental and social standards. This allows investors to engage with sustainability criteria more confidently (Öz & Gören, 2019). Transparency helps investors make more informed decisions and facilitates the flow of capital toward environmentally and socially responsible companies (KPMG Türkiye, n.d.).

Artificial intelligence (AI) and big data analytics enable the processing and interpretation of ESG data. Companies' sustainability performance can be analyzed using quantitative data and presented to investors through these technologies. This not only benefits large institutional investors but also improves access and trust in sustainable financial products for individual investors (Istanbul Chamber of Industry, 2023).

One of the most significant impacts of fintech is the strengthening of financial inclusion. Thanks to solutions such as digital banking, mobile payment systems, and cryptocurrency wallets, individuals without access to banking services can now participate in the financial system. This inclusivity plays a critical role in achieving sustainable development goals, especially in developing countries. As financial inclusion increases, more segments of society gain the opportunity to invest in sustainable projects (Özbilen, 2022).

In addition, investing in sustainability-focused funds has become much easier through digital investment platforms. These platforms offer investors the opportunity to generate not only economic returns but also environmental and social impact. As a result, small-scale investors can directly contribute to projects that support climate change mitigation or social justice (Tümer & Canko, 2023).

Financial inclusion is one of the core pillars of sustainable development. Fintech solutions help reduce social inequalities by making investment tools more accessible, especially for low-income groups and those excluded from traditional financial systems. Thanks to innovative applications such as mobile banking and digital wallets, more individuals are being guided toward sustainable investments (Kutbay, 2024).

ESG Analysis with Big Data and Artificial Intelligence

Today, financial technologies (fintech) ensure that investment decisions are no longer limited to financial returns but also consider environmental, social, and governance (ESG) criteria. In this transformation, big data and artificial intelligence (AI) technologies play a crucial role in conducting ESG analyses more effectively and comprehensively.

Big data enables the collection and processing of diverse and voluminous data in ESG analyses. These data come from various sources such as sustainability reports of companies, social media content, news articles, and publicly available financial information. Yıldız (2022) notes that the use of AI in finance has had a significant impact in areas such as taxation, accounting, auditing, and reporting. Similarly, these technologies are used in ESG performance assessments to offer more comprehensive analysis to investors.

AI provides advantages in terms of automation and speed when evaluating ESG criteria. Through natural language processing (NLP) techniques, sustainability reports and other textual data of companies can be analyzed to obtain objective and timely insights into their ESG performance. Supported by big data and AI technologies, fintech applications allow ESG analyses to be conducted more transparently and reliably. These technologies offer investors the ability to evaluate not only financial returns but also the sustainability performance of companies. Küçükkıralı and Afşar (2022) discussed how digital data is utilized in financial decision-making processes and how such data is evaluated within ESG analyses in their study on the financialization of digital data and platform capitalism.

Fintech-Based Sustainability Platforms

In recent years, financial technologies (fintech) have not only transformed traditional financial services such as banking and payment systems but have also created a paradigm shift in the investment world by integrating with structures that support environmental and social sustainability. Sustainability-oriented digital solutions have made the integration of ESG criteria into investment processes more accessible, transparent, and interactive through dedicated platforms. In this context, fintech-based sustainability platforms allow investors to analyze not only financial returns but also the social impact of their investments (Cantürk, 2024). These platforms, equipped with tools such as blockchain technologies, artificial intelligence, big data analytics, and digital wallets, both inform investors and accelerate the flow of funds to sustainable projects.

Sustainability platforms also serve as digital spaces that bring together environmentally focused investors with project owners in need of funding. These platforms eliminate intermediary costs associated with traditional investment channels, increase transparency, and significantly speed up transaction processes. For instance, a company issuing green bonds can reach investors through fintech-based sustainability platforms and share real-time data on the carbon footprint, energy efficiency, or social contribution levels of its projects. In this way, investors can make more informed choices based not only on profitability but also on impact evaluations.

The influence of fintech platforms on public policy is also growing. Digitally developed systems focused on sustainability enable governments and regulatory authorities to implement sustainable finance objectives more effectively. For example, the digitalization of carbon markets, the construction of financial systems compatible with environmental tax regulations, and the management of national green funds can all be carried out using fintech infrastructure. This makes fintech a strategic partner in sustainability efforts not only for the private sector but also for public institutions (Cambaz, 2023).

6. Fintech Development in Türkiye and Sustainable Investments

The ongoing digital transformation in the global financial system is not only reshaping the structure of traditional financial services but also revolutionizing the financial dimension of sustainable development goals. Financial technologies (FinTech) serve as one of the primary driving forces of this transformation by significantly contributing to the expansion and accessibility of sustainable investments. In this context, the Türkiye Financial Ecosystem Evaluation Report 2024 (TFEDR 2024), published by the Presidency of the Republic of Türkiye Finance Office, is a key resource for understanding the interaction between fintech development and sustainable investment practices in Türkiye.

According to TFEDR 2024, access to digital financial services in Türkiye has been increasing rapidly, and this rise directly influences interest in sustainable financial instruments. As of 2023, the number of mobile payment users exceeded 16 million, while the number of digital banking customers surpassed 100 million. These developments highlight fintech's potential to boost financial inclusion and, in particular, facilitate individual investors' access to sustainable financial products.

The report also emphasizes that fintech solutions are not limited to payment systems but have also transformed investment decision-making processes. Investment products such as green bonds, sustainable funds, and ESG-based financial instruments, accessible through digital

platforms, make it easier for investors to make sustainability–focused financial decisions. Thus, fintech applications not only offer speed and convenience but also encourage investment preferences with environmental and social impact (Presidency of the Republic of Türkiye Finance Office [CBFO], 2024).

Meanwhile, the Sustainability Report (2023). published by the Banks Association of Türkiye (TBB) demonstrates how sustainability is being integrated into the banking sector through digitalization. The report notes that banks, through collaborations with fintech firms, are delivering environmentally friendly products to broader audiences, associating digital credit systems with sustainability scores, and managing climate change risks as part of the banking system. These developments make the contribution of fintech to sustainability within the banking ecosystem increasingly visible (Banks Association of Türkiye [TBB], 2023).

7. Research Data and Method

In this study, a quantitative research method was adopted to examine the relationship between fintech indicators and sustainable investment performance. The dependent variable used in the analysis is CO_2 emissions, representing environmental sustainability, while the independent variable is the number of internet banking users, indicating the use of digital financial services. Data were collected in the form of a time series covering quarterly periods between 2016 and 2024. A simple linear regression analysis was applied to test the effect of the independent variable on the dependent variable. The primary statistical method used in this study is regression analysis. Simple Linear Regression Analysis

Regression analysis is a statistical technique used to measure the direction, strength, and significance of the relationship between a dependent variable and one or more independent variables. The most common form, the linear regression model, expresses the relationship between variables using a linear equation. Through the regression model, the impact of changes in the independent variable on the dependent variable is measured and statistically assessed.

$$Y = a + bX$$

In statistical analysis, regression is used to determine relationships between changes in certain variables and others. It can indicate the strength of such relationships and assess their statistical significance. Regression is a powerful tool for statistical inference and is also used to predict future outcomes based on past observations (Beers, 2022).

Research Hypotheses

To test the main hypothesis of the study, the following sub-hypotheses were developed concerning internet banking user numbers and CO_2 emissions:

- H_{01}: There is no statistically significant relationship between the number of internet banking users and CO_2 emissions.
- H_{11}: There is a statistically significant relationship between the number of internet banking users and CO_2 emissions.

Through the conducted regression analysis, the impact of the independent variable (number of internet banking users) on the dependent variable (CO_2 emissions) was measured. The findings support a statistically significant relationship between fintech indicators and environmental sustainability, thus validating the study's main hypothesis. The results are presented in detail along with relevant tables.

Table 1. Descriptive Statistics

Descriptive Statistics			
Variable	**Mean**	**Std. Deviation**	**N**
CO_2 Emissions	66,8097	4,34991	36
Internet Banking Users	6341226,69	7424850,818	36

Since CO_2 emissions are a key indicator of sustainability, they were selected as the dependent variable in this study. Using data from quarterly periods between 2016 and 2024, CO_2 emissions were predicted through a single dependent variable. Table 1 indicates that 36 observations were used covering the quarterly periods from 2016 to 2024.

Table 2. Correlations

Correlations			
	Variable	**CO_2 Emissions**	**Internet Banking Users**
Pearson Correlation	CO_2 Emissions	1	−0,769
	Internet Banking Users	−0,769	1
Sig. (1−tailed)	CO_2 Emissions	.	0
	Internet Banking Users	0	.
Number of Observations (N)	CO_2 Emissions	36	36
	Internet Banking Users	36	36

In correlation analysis, we examine whether there is a statistically significant relationship between two variables. A significance (Sig.) value less than 0.05 indicates that the result is statistically significant. As shown in Table 2, the Sig. value is 0.000. Since 0.000 < 0.05, there is a statistically significant relationship between CO_2 emissions and internet banking usage.

The analysis found a strong and negative relationship between the number of internet banking users and CO_2 emissions (r = −0.769; p < 0.01). The negative sign of the correlation coefficient indicates an inverse relationship between the variables. In other words, as the use of internet banking increases, environmental impacts (particularly carbon emissions) tend to decrease. This can be interpreted as digital banking services contributing to environmental sustainability by reducing the need for physical transactions and paperwork.

Table 3. Model Summary

Model Summary[b]										
						Change Statistics				
Model	**R**	**R² (R Square)**	**Düzeltil miş R² (Adjuste d R²)**	**Tahmin Hatası Std. Sapma (Std. Error of the Estimate)**	**R Square Change**	**F Değişimi (F Change)**	**df1**	**df2**	**Anlaml ılık (Sig. F Change)**	**Durbin - Watso n**
1	,769[a]	.591	.579	2,82311	.591	49,095	1	34	.000	.615

As shown in Table 3, the R^2 value indicates a strong and significant relationship between the independent variable (internet banking) and the dependent variable (CO_2 emissions). This supports the statistical significance of the model.

Table 4. ANOVA Test Outcomes

ANOVA[a]					
Model	**Kareler Toplamı (Sum of Squares)**	**sd (df)**	**Ortalama Kare (Mean Square)**	**F Değeri (F)**	**Anlamlılık (Sig.)**
Regression (Regresyon)	391,282	1	391,282	49,095	.000[b]
Residual (Artık)	270,979	34	7,970		
Total	662,261	35			

According to the ANOVA results, the significance value (Sig.) is less than 0.05, indicating that the model is statistically meaningful. The F-value of 49.095 and significance level of 0.000 confirm that the independent variable (internet banking users) has a significant effect on the dependent variable (CO_2 emissions). These findings support the reliability and validity of the model.

Regression Coefficients Table

The coefficients table provides the regression coefficients and their statistical significance. Based on Table 8.5, it can be observed that a one-unit increase in internet banking users results in a 0.0000004503 unit decrease in CO_2 emissions.

Regression Equation:

$$CO_2\ \text{Emissions} = 73.185 - 0.0000004503 \times \text{Internet Banking Users}$$

The coefficient B = $-4.503E-7$ is negative and statistically significant ($p < 0.001$), suggesting that an increase in internet banking usage leads to a decrease in CO_2 emissions. The standardized beta coefficient is -0.769, confirming the strong and negative influence of the variable. The t-value is -7.007, indicating a high level of statistical significance. These results support the conclusion that internet banking usage may have positive implications for environmental sustainability.

8. Conclusion

In this study, the impact of digital financial technologies (fintech) on sustainable investment performance was analyzed using the case of Türkiye. Data from quarterly periods between 2016 and 2024 were used, where the number of internet banking users was evaluated as a fintech indicator and CO_2 emissions were employed as a proxy for environmental sustainability. The findings revealed a significant and negative relationship between the spread of internet banking and carbon emissions.

Financial technologies enable transactions to be conducted digitally, thereby reducing the need for physical infrastructure, accelerating transaction processes, and improving energy efficiency. In this context, the widespread adoption of fintech applications such as internet banking minimizes the consumption of paper, physical branch visits, transportation, and other resource-intensive activities, thus creating positive environmental impacts. The negative correlation obtained from the analysis supports the notion that a similar pattern is observed in Türkiye. The statistical evidence indicates that the increase in internet banking users has a decreasing effect on CO_2 emissions.

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