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Sustainability Index and Stock Performance: An Empirical Study on Banks Operating in Türkiye

Sürdürülebilirlik Endeksi ve Hisse Senedi Performansı: Türkiye'de Faaliyet Gösteren Bankalar Üzerine Ampirik Bir Çalışma

Mustafa Eser Kurum [a,*]

[a] Dr., İstanbul Yeni Yüzyıl Üniversitesi, Bankacılık ve Sigortacılık Bölümü, 34010, İstanbul/Türkiye
ORCID: 0000-0002-5179-6876

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ÖZ

Bu çalışmada, Türkiye'de faaliyet gösteren bankaların BIST Sürdürülebilirlik Endeksi'ne dahil edilmesinin hisse senedi fiyatları üzerindeki etkisi araştırılmıştır. Ocak 2013'ten Mayıs 2025'e kadar olan aylık panel verileriyle yapılan analizde, Panel Fourier ARDL modeli kullanılarak kısa ve uzun vadeli dinamikler incelenmiştir. İşlem hacmi, enflasyon ve politika faizi kontrol değişkenleri olarak modele dahil edilmiş; Fourier terimleri ise yapısal kırılmaları yakalamak amacıyla kullanılmıştır. Elde edilen ampirik bulgular, sürdürülebilirlik endeksine dahil olmanın hisse senedi fiyatları üzerinde kısa vadede istatistiksel olarak anlamlı ve pozitif etkiye sahip olduğunu ortaya koymakta ve yatırımcıların bu üyeliği olumlu bir piyasa sinyali olarak değerlendirdiğini göstermektedir. İşlem hacminin kısa ve uzun vadede hisse senedi fiyatlarının en güçlü belirleyicisi olduğu, enflasyonun uzun vadede olumlu ancak zayıf bir etki gösterdiği; politika faizinin ise anlamlı bir etkisinin bulunmadığı tespit edilmiştir. Sonuçlar, sürdürülebilirlik endeksine katılımın piyasa güvenini ve hisse senedi değerlemesini artırdığını ortaya koymakta; aynı zamanda Türkiye gibi gelişmekte olan finansal piyasalarda sürdürülebilirliğin finansal performansı şekillendirmedeki artan rolünü vurgulamakta ve politika yapıcılar, yatırımcılar ve banka yöneticileri için önemli çıkarımlar sunmaktadır.

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ABSTRACT

This study investigates the impact of inclusion in the BIST Sustainability Index on stock prices of banks operating in Türkiye. In the analysis, conducted with monthly panel data from January 2013 to May 2025, short- and long-term dynamics are examined using the Panel Fourier ARDL model. Trading volume, inflation, and the policy rate are included as control variables, while Fourier terms are employed to capture structural breaks. The empirical findings reveal that inclusion in the sustainability index has a statistically significant and positive impact on stock prices in the short term, indicating that investors consider inclusion as a positive market signal. Trading volume is found to be the strongest determinant of stock prices in the short and long term, while inflation has a positive but weak long-term effect, and the policy rate has no significant effect. The results demonstrate that inclusion in the sustainability index enhances market confidence and stock valuations, while also highlighting the growing role of sustainability in shaping financial performance in emerging financial markets like Türkiye, offering important implications for policy makers, investors, and bank managers.

1. Introduction

The concept of sustainability emphasizes that businesses must consider their environmental and social responsibilities while pursuing their economic goals. In earlier debates, the dominant view, exemplified by Friedman (2007), argued that the primary duty of firms was profit maximization. However, since the 1990s, a paradigm shift has taken place, with corporate sustainability and social responsibility being

* *Sorumlu yazar/Corresponding author*.
e-posta: *mustafaeser.kurum@yeniyuzyil.edu.tr*

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integrated into firms' long-term value creation strategies (Dyllick & Hockerts, 2002; Tokgöz & Önce, 2009). Today, sustainability is regarded not only as a social necessity but also as a strategic approach for ensuring corporate reputation, risk management, and competitiveness.

With the increasing importance of sustainability, indices have been developed to evaluate and communicate companies' performance in this field. While the first sustainability indices were established in developed markets during the 1990s, emerging economies introduced them later. In Türkiye, the BIST Sustainability Index was launched in November 2014 to highlight companies with superior sustainability performance. The index aims to raise awareness, encourage good practices, and provide investors with a reliable benchmark. For firms, entry into the index is associated with both prestige and competitive advantage, as it signals compliance with environmental, social, and governance (ESG) standards. The index was later expanded to include the BIST Sustainability 25, covering the most valuable and actively traded firms with high sustainability scores. These developments indicate that the index has become an important tool in Türkiye for integrating sustainability into financial markets. However, despite the growing relevance of these indices, evidence on their financial implications—particularly within bank-centered emerging markets—remains limited.

The banking sector holds a particularly critical role in this context. Beyond their central function in maintaining financial stability and allocating resources, banks are also responsible for managing environmental and social risks. Their inclusion in the BIST Sustainability Index signals adherence to corporate governance and ethical standards, potentially enhancing their reputation, improving access to international funds, and strengthening investor confidence. At the same time, meeting sustainability requirements may impose additional compliance costs, making the overall financial effect of index membership theoretically ambiguous (Weber, 2017; Şengül, 2025). This ambiguity is especially relevant for banks, whose visibility, regulatory exposure, and stakeholder expectations differ substantially from non-financial firms.

Several theoretical perspectives have been suggested to explain how inclusion in a sustainability index affects firm value and stock performance. According to the information cost hypothesis (Merton, 1987), index membership reduces information asymmetry, broadens the investor base, and enhances share liquidity. Similarly, the signaling hypothesis suggests that independent verification of environmental and social performance provides a positive signal about the firm's management quality and long-term orientation, which may boost investor confidence. In contrast, other scholars emphasize the cost dimension, noting that sustainability expenditures may reduce profitability in the short run (López et al., 2007). These contrasting perspectives imply that the relationship between sustainability index membership and financial outcomes is not straightforward and requires empirical analysis. From this theoretical standpoint, the expected market reaction to sustainability index inclusion becomes an empirical question—particularly for banks, whose information environment and governance structures may strengthen the signaling and information-cost channels.

Within this framework, the present study focuses on the impact of the inclusion of banks operating in Türkiye in the BIST Sustainability Index on their stock performance. Employing the panel Fourier ARDL method and monthly data covering the period 2013–2025, the study investigates both short- and long-term effects. The contribution of this research is twofold: first, it provides empirical evidence on the financial implications of sustainability index membership in the banking sector of an emerging market; second, it offers insights for policymakers and investors on how sustainability-oriented strategies are reflected in capital markets. In contrast to earlier studies in Türkiye—such as Acar and Temiz (2018), Altınay et al. (2017), and Gündüz (2018)—which generally report limited or insignificant market reactions to sustainability index inclusion, this study presents evidence of a short-term positive response for banks. The unique contribution of the study is that it is the first to examine this relationship for Turkish banks using an extended 2013–2025 dataset together with a Fourier ARDL approach that captures structural shifts more effectively.

2. Literature Review

The association between corporate sustainability and financial performance is well-investigated within the literature, with many early research studies identifying a positive correlation. For example, Waddock and Graves (1997) identified a positive correlation between corporate social performance and financial performance, while Orsato et al. (2015) identified the reputation benefits of being listed on sustainability indices. Alshehhi et al. (2018), in a comprehensive review of 132 studies, reported that 78% of them revealed a robust positive association between sustainability practices and corporate profitability. Evidence for direct stock price impact on inclusion in sustainability indexes, however, is less consistent. López et al. (2007) pointed out that while being a member of the Dow Jones Sustainability Index (DJSI) has a negative influence on short-term profitability since sustainable operations come at a high cost in the initial phases, studies like Oberndorfer et al. (2013) and Stekelenburg et al. (2015) found index membership not to be significantly or immediately effective on stock returns. Ziegler (2012) similarly documented that the financial impact of DJSI World Index membership varied geographically, having a positive impact on ROA in continental Europe but not Anglo-Saxon countries, and no overall main effect on market value. In addition, in line with this perspective, Wagner (2010) found that the relationship between firm value (Tobin's Q) and advertising intensity depends on sustainability performance, indicating that sustainability outcomes are shaped by firm-specific strategies.

However, some studies suggest that inclusion in sustainability indices can lead to positive financial outcomes under certain conditions. Ziegler (2012) analyzed the impact of inclusion in the Sustainability Index on firm performance by conducting a panel data analysis of European firms between 1999 and 2003. The results showed that index membership had no significant effect on return on assets (ROA) in Anglo-Saxon countries (e.g., the United Kingdom and Ireland); however, inclusion in the index had a positive effect on ROA in continental European countries. However, the same study found no significant effect of sustainability index membership on market value as measured by the Tobin's Q ratio (Ziegler, 2012). Using a similar approach, Wagner (2010) found in his study of US firms that the relationship between corporate sustainability performance and Tobin's Q is not directly significant but that this relationship can vary depending on the intensity of the firm's advertising expenditures. This implies that the effect of sustainability activities on market value may be interactive with factors such as the company's communication strategies.

When examined on a sectoral basis, the effect of sustainability performance on economic results in the banking industry has also been investigated. A study conducted on Chinese banks revealed that banks that complied with environmental and social regulations between 2009 and 2013 were able to integrate sustainability practices without experiencing a decline in their financial performance. Furthermore, the increase in sustainability performance had a significant positive effect on financial performance (Weber, 2017). This finding shows that sustainability initiatives in the banking sector can create a "win-win" situation. On the other hand, Buallay et al. (2020) examined 882 banks from developed and developing countries between 2008 and 2019 following the global financial crisis and evaluated the impact of environmental, social, and governance (ESG) scores on bank performance. The results showed that, in general, ESG performance has a statistically negative relationship with banks' account-based (ROA, ROE) and market-based (Tobin's Q) performance. The authors note that this inverse relationship is particularly evident in emerging economies, emphasizing that the contribution of sustainability efforts to bank performance may vary depending on the environment and period. In summary, it is difficult to reach a common conclusion in the international literature regarding the financial effects of inclusion in sustainability indices: While some studies support positive effects (Ameer & Othman, 2012; Pätäri et al., 2012), others point to neutral or negative effects (López et al., 2007; Santis et al., 2016; Buallay et al., 2020). This situation can be attributed to the impact of factors such as market development level, cultural factors, sector dynamics, and the study period on the results.

In Türkiye, there is more empirical research in recent years on the financial impacts of BIST Sustainability Index membership, and several of these investigate the short- and long-term contribution of index inclusion to firm value or stock returns. Several of these employ the event study methodology to analyze market reactions around announcement dates. For instance, Çıtak and Ersoy (2016) found that while long-term returns did not differ materially for included and non-included firms, a statistically significant short window (0 to +3 days) cumulative abnormal return around the inclusion announcement was observed, which reflected a positive investor response in the short term. However, Acar and Temiz (2018) detected no significant excess returns for newly included firms to the index, indicating that the market may not price sustainability announcements fully. Studies that have concentrated on the banking sector offer additional details: Altınay et al. (2017) contrasted pre- and post-inclusion share price performance of major Turkish banks and, even after observing an 81% correlation between share prices and index levels, failed to find a statistically significant difference between pre- and post-inclusion average share prices. Similarly, Gündüz (2018), using panel data for 2014–2016, did not identify any significant effect of index membership on stock value. Most recently, Şengül (2025), employing the MES methodology, identified that even large, publicly traded Turkish banks became more vulnerable to systemic risk after the pandemic, pointing out that membership in a sustainability index alone may not enhance resilience against macroeconomic stress.

The general trend in Turkish literature suggests that it is challenging to draw a definitive conclusion about the effect of participation in a sustainability index on financial outcomes. While many studies do not mention a significant effect, some have identified limited positive responses and improvements. These differences are thought to stem from factors such as the length of the period covered in the studies, the analysis method, and the sector and company samples. Additionally, the fact that investor interest in sustainability is not yet at the desired level in emerging markets such as Türkiye, compared to developed countries, also contributes to the complexity of the findings. Indeed, some researchers have stated that investors in Türkiye do not sufficiently consider non-financial information such as sustainability or social responsibility, and therefore, the value-creating effects of index membership remain limited (Batır, 2024). In conclusion, the literature findings indicate that participation in a sustainability index does not guarantee strong performance on its own; however, under the right conditions, it can contribute to both the reputation and financial outlook of companies. The analysis in this study will contribute to filling the gap in the literature by revealing the long-term dynamics of this effect in the banking sector in Türkiye.

3. Data and Methodology

3.1. Data Description

The Sustainability Index was launched on November 4, 2014. Additionally, the Sustainability 25 Index was introduced on November 21, 2022. Over the years, nine banks were identified as participants in these indices at various points in time. These banks and their respective

entry dates are as follows: Akbank, Garanti Bankası, Vakıflar Bankası, and Yapı ve Kredi Bankası in November 2014; İş Bankası and Türkiye Sınai Kalkınma Bankası in November 2015; Türkiye Halk Bankası in November 2016; Şekerbank in November 2018; and Albaraka Türk in November 2019 (BIST, 2025). To enable a comparison of the periods during which these banks were included in the index, the analysis period was initiated in 2013. For the purpose of this study, a panel data set was created to analyze the effects of including banks operating in Türkiye into the BIST Sustainability Index on their stock prices. The data set used is from January 2013 to May 2025. The data set, which is built at a monthly frequency, is set to include both dependent and independent variables.

Stock price is created by taking the natural logarithm of the monthly closing stock prices of banks. The data is obtained from the Investing.com platform. Stock price is the main dependent variable of the study in terms of directly representing the bank valuation. The effect of being included in the sustainability index on these prices is the main purpose of the model. Therefore, a sustainability dummy variable was created to measure the effect we want to examine. The sustainability dummy is a binary variable indicating whether the bank belongs to the Index in the relevant month. It takes the value of 1 in the periods when it is included in the index and 0 in the other periods. This variable was used to test the main hypothesis of the study.

Table 1: Descriptive Statistics

Variable	Definition	Mean	Std. Dev.	Min	Max	Source
Stock price	Stock price	7.2239	13.6281	0.5300	124.4200	https://tr.investing.com/
Volume	Trading volume (Million TL)	1963.2400	2561.9880	4.5900	23500.000	https://tr.investing.com/
Inflation	CPI (%)	706.2324	696.8442	216.6300	2938.9500	https://data.tuik.gov.tr/
Interest rate	central bank policy rate (%)	15.8257	12.7702	4.5000	50.0000	https:// evds2.tcmb.gov.tr/

In addition to these, bank-specific and some macro variables that may affect stock prices at monthly frequencies are included in the model as control variables. The first of these variables is the monthly transaction volume of bank stocks. Again, it was obtained from Investing.com. As an indicator of investors' interest and market liquidity, transaction volume is one of the most important financial variables that will have an impact on stock prices in the short as well as long run. The second variable is policy interest rate announced by the Central Bank of the Republic of Turkey (CBRT). Data were gathered from the CBRT Electronic Data Distribution System (EVDS) directly. The interest rate is a variable that is theoretically expected to be negatively related to stocks. While capital allocation is generally directed to fixed-income instruments in high-interest environments, decreases in interest rates may increase the demand for stocks. Finally, the inflation rate is also included in the model. It was obtained from the Turkish Statistical Institute (TUIK). High inflation rates may cause investors to turn to stocks in search of real returns. However, since it may also increase economic uncertainty, a negative effect may also be observed. In addition, Fourier terms were included in order to model structural breaks that may be observed in time series. These terms replace the deterministic trend, making the model sensitive to breaks in the series.

Summary statistics of the variables used in the study are presented in Table 1. The average stock price is approximately 7.20. The large standard deviation (13.6) indicates significant fluctuations in time and bank. The average value of transaction volume is around 1963 million TL. The maximum value of 10.06 indicates that very intensive transactions were made in certain bank stocks in some periods. The relatively high standard deviation (1.48) suggests that there are significant fluctuations in liquidity according to time and institution.

The high values observed in the inflation variable are due to the fact that the periods of excessive price increases in the Turkish economy coincide with the period covered by this study. The average value of the CBRT policy rate data is 15.82%. This value reflects the monetary policy trends implemented in Türkiye during the analyzed period. The maximum value being 50% and the minimum being 4.5% indicate that there are serious fluctuations in interest rates. These fluctuations provide an important basis for testing the potential impact of the policy rate on investor decisions and stock prices. It is thought that the policy rate affects both short-term funding costs and the attractiveness of investment alternatives.

The variables in the data set show sufficient variance for empirical analysis. It is understood that bank-based differences can be observed in terms of both price and volume. The wide distribution in interest and inflation rates shows that macroeconomic conditions can be effectively represented in the model. In particular, the relationship between the dependent variable log (stock price) and transaction volume has been supported both theoretically and in previous studies, and a positive relationship is expected. The effects of policy rate and inflation may differ depending on market conditions and investor behavior. Therefore, separating the short-term and long-term effects of these two macroeconomic variables in the model is important in terms of reaching correct results.

3.2. Methodology

Techniques of analysis used in our study include panel unit root tests, cointegration tests, and long-run estimation methods for the purpose of tracing the time and cross-sectional dynamics of the panel data set. The IPS test allows for a particular unit root process for each cross-section of the panel data set (Im, Pesaran, and Shin, 2003). That is, it is a panel unit root test that allows for heterogeneity across cross-sections. The IPS test is based on the following equation:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{p} \emptyset_{ij} \Delta y_{i,t-j} + \epsilon_{it} \quad (1)$$

$$\Delta y_{it} = y_{i,t} - \Delta y_{i,t-1}$$

α_i is the constant term, while it can vary between cross-sections.

β_i is related to the existence of a unit root, and the null hypothesis is that this term is equal to zero.

$\emptyset_{ij}$, are the coefficients of lagged difference terms.

ϵ_{it} indicates the error terms.

The IPS panel unit root test is a method for testing the presence of unit roots in panel data analysis and accounting for heterogeneity across cross-sections. The test addresses heterogeneity in time series behavior across countries, regions, or industries using the convenience of having a unique unit root process for each cross-section. The test subjects are each cross-sectioned in the panel data set to unit root tests separately and pooled to produce a combined statistic. The null hypothesis is that all the cross-sections are unit roots, and the alternative hypothesis is that they have at least one stationary cross-section. It is especially relevant in cases with high cross-sectional heterogeneity and is different from homogeneity assumption tests for the panel in this sense (Im, Pesaran, and Shin, 2003).

However, these first-generation unit root test assumptions may be inaccurate due to the presence of significant interdependencies among panel units (IPS). In particular, these tests assume cross-sectional independence, which is violated in the presence of latent variables or common shocks that cover the contemporaneous reliance of all nations. In order to solve this problem, we used Pesaran's (2007) Cross-sectionally Augmented IPS (CIPS) test, which incorporates the cross-sectional means of the independent and dependent variables into the test equation to account for cross-sectional dependency. Panels with relatively tiny cross-sectional units (N) and relatively long temporal dimension (T), like the ones used in this study, are especially well-suited for the CIPS test. With the CIPS test, biased inference due to omitted cross-sectional dependence is evaded, and stronger evidence on the integration properties of the variables is supplied.

One of the methods frequently used in time series and cross-sectional time series analyses is the Autoregressive Distributed Lag (ARDL) model. The purpose of using this model, developed by Pesaran et al. (2001), is that it allows for the estimation of both short-term and long-term impacts using the ARDL model, while also accommodating variables with different degrees of stationarity, and can be applied to a small number of samples. Several extensions have been applied to this approach, including non-linear relationships (Shin et al., 2014; Yıldız, 2025) and Fourier extensions (Faisal et al., 2021; Wu et al., 2021).

This research employs the panel Fourier ARDL (FARDL) model to investigate the impact of inclusion in the sustainability index on the stock prices of banks operating in Türkiye. The FARDL approach extends the conventional ARDL framework by incorporating Fourier terms to capture smooth structural shifts and non-linear adjustments without requiring prior knowledge of structural break dates. This methodology is particularly suitable for panel data settings with heterogeneous units, as it allows the modeling of panel-specific dynamics while controlling for smooth regime changes over time.

The general structure of the model is expressed as follows:

$$y_{i,t} = \alpha_i + \sum_{p=1}^{P} \alpha_{i,p} y_{i,t-p} + \sum_{q=0}^{Q} \beta_{i,q} x_{i,t-q} + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_{i,t} \quad (2)$$

In this equation, $y_{i,t}$ is the dependent variable for id i at time t, $x_{i,t}$ is the independent variables, α_i is the individual-specific fixed effect, γ_1 and γ_2 are the coefficients of Fourier terms, k is the frequency, T is the number of time periods, and $\varepsilon_{i,t}$ is error term. Thanks to the Fourier transform, structural breaks can be integrated into the model in a fluctuating and continuous manner without being fixed to specific date intervals.

The specific Fourier ARDL model used in this study is constructed as follows;

$$(\ln bist)_{i,t} = \alpha_i + \sum_{p=1}^{P} \lambda_{i,p} (\ln bist)_{i,t-p} + \sum_{q=0}^{Q_1} \beta_{i,q} \ln volume_{i,t-q} + \sum_{q=0}^{Q_2} \phi_{i,q} inflation_{i,t-q} + \sum_{q=0}^{Q_3} \theta_{i,q} interest_{i,t-q} + \delta_1 D_{i,t} + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_{i,t} \quad (3)$$

where $D_{i,t}$ is a dummy variable capturing the being included in the BIST Sustainability index.

This modeling strategy allows for the simultaneous estimation of long- and short-term relationships while accounting for smooth structural changes. By integrating the Fourier function, the model can flexibly accommodate gradual shifts in the underlying data-generating process, which is particularly important in the context of developing economies undergoing integration into regional and global markets. The panel FARDL framework thus provides a robust basis for testing both the equilibrium relationships and the dynamic adjustment processes of bank stock prices—particularly following sustainability index inclusion in response to key macroeconomic drivers.

In Fourier-based ARDL specifications, the optimal frequency parameter (k) determines the flexibility with which smooth structural shifts are captured. Following Enders and Lee (2012), alternative frequency values between 0 and 5 were estimated, and the value minimizing the Akaike Information Criterion (AIC) was selected. Accordingly, k = 1 was identified as the optimal Fourier frequency for the panel, indicating the presence of a single smooth structural shift over the sample period.

4. Empirical Results

Empirical findings of the Fourier Panel ARDL model, which was estimated to examine the determinants of bank stock prices, are presented here. As shown in Table 4, the optimal Fourier frequency parameter was selected as k = 1 based on the minimum AIC value. The analysis is based on monthly panel data for banks constituting the BIST Sustainability Index from January 2013 to May 2025. Logarithm of bank stock prices (ln_bist) has been taken as the endogenous variable in the model. Exogenous variables include logarithmic volume traded (ln_volume), inflation rate, policy rate, and a dummy variable (DUM) indicating whether the bank is included in the sustainability index. Fourier terms (SIN and COS) are included to flexibly capture structural breaks in the model.

Table 2: Unit Root Tests

Before applying the Fourier Panel ARDL model to the panel data set, the stationarity degrees of all series were tested. For this purpose, IPS, CIPS, ADF, and Zivot-Andrews (2002) unit root tests were used.

IPS and CIPS tests show that the ln_bist variable is not stationary at the level, but its first difference is stationary at the 1% significance level according to both IPS and CIPS tests. In particular, the t-statistic in the trended version of the CIPS test confirms stationarity at the 1% significance level with -6.420. This finding supports the conclusion that ln_bist is I(1). ln_volume was found to be stationary at the level according to both IPS and CIPS tests. All test statistics are beyond the critical values at the 1% significance level. This result reveals that the ln_volume variable has I(0) properties.

Since the macroeconomic control variables are the same for each panel, unit root tests suitable for time series were applied to them. According to the Zivot-Andrews test, the inflation series is not stationary at the level; however, its first difference was found to be significantly stationary. This result shows that the inflation series has an I(1) degree of integration. According to the Zivot-Andrews test results, the interest rate is classified as I(0) at the level. The significance level is 1% in both test versions with t-statistics -6.224 and -5.150. Consequently, the Fourier Panel ARDL method's applicability is confirmed by the co-existence of variables with I(0) and I(1) features among the variables included in the model. Variables with varying degrees of integration can be analyzed together using this method.

	IPS		**CIPS**	
Variable	**Without trend**	**With trend**	**Without trend**	**With trend**
ln bist	5.9327	3.6144	-2.010	-3.031***
Δln bist	-36.4094***	-37.6366***	-6.190***	-6.420***
ln volume	-3.9320***	-7.1262***	-3.1986***	-3.7999***
	ADF		**ZA**	
Inflation	4.855	3.304	0.331	-2.863
ΔInflation	-0.307	-4.885***	-5.166**	-6.107***
Interest rate	2.583*	-3.734**	-6.224***	-5.150**

Notes: ** and *** → the rejection of the null hypothesis of the unit root tests at a 5% and 1% significance levels.Δ → first difference.

Prior to conducting the ARDL test, the Kao (1999) cointegration test was employed to examine the presence of cointegration among the series. The results of the test are presented in Table 3.

Table 3: Cointegration Test Results

	t-Statistic	P-value
ADF test statistic	-2.684589	0.0036

Table 3 provides evidence of a cointegrating relationship among the variables. Consequently, the analysis proceeds with the estimation of the ARDL model, the results of which are presented in Table 4.

Table 4: Estimation Results of the FARDL(1, 1, 1, 1) Model

VARIABLES	PMG Model
Short Run	
EC	-0.1490***
	(0.0324)
Δln_volume	0.0346***
	(0.0103)
ΔInflation	0.0006
	(0.0004)
ΔInterest	0.0035
	(0.0026)
DUM	0.0363***
	(0.0114)
SIN	0.0235*
	(0.0138)
COS	0.0583***
	(0.0129)
Constant	-0.0906*
	(0.0464)
Long run	
ln_volume	0.1569***
	(0.0304)
Inflation	0.0006***
	(0.0001)
Interest	-0.0032
	(0.0035)
Observations	1314
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

The model estimation is based on the Pooled Mean Group (PMG) method. According to the AIC information criterion, k=1 was taken for the Fourier terms. The addition of Fourier terms provided flexible modeling of structural breaks. The model offers both short-term and long-term coefficient estimates.

When the short-term dynamics were examined, the error correction term (EC) was found to be significant with a coefficient of -0.1490. This coefficient demonstrates that the variables in the model have a long-term cointegrated connection. At the same time, it indicates that the speed of the system returning to equilibrium in cases of imbalance is 14.9%. This rate shows that stock prices return to equilibrium levels in a reasonable time after shocks. The difference of the log (trading volume) variable (Δln_volume) in the short term is positive and statistically significant, showing that increases in trading volume affect stock prices upwards in the short term. This effect supports the positive reflection of the increase in liquidity on prices.

Inflation has a small but positive short-term impact. This suggests that short-term stock values are not statistically significantly impacted by inflation shocks. Short-term changes in monetary policy have little effect on stock values, as seen by the interest rate variable's lack of short-term significance.

The sustainability dummy variable (DUM) has a positive and significant effect in the short term (coefficient: 0.0363, $p<0.01$). This result reveals that the participation of a bank in the index creates a positive short-term effect on investor perception and increases stock prices. The Fourier terms SIN and COS coefficients are also statistically significant. The SIN coefficient is estimated as 0.0235 ($p<0.1$) and the COS coefficient is estimated as 0.0583 ($p<0.01$). This result confirms that structural fluctuations and periodic effects occurring during the period play a significant role on stock prices. The significance of the Fourier terms shows that the model successfully captures structural breaks.

When the long-term coefficient estimates are examined, Log(trading volume) has a positive and highly significant effect on stock prices in the long term (coefficient: 0.1569, $p<0.01$). This shows that the increase in trading volume is reflected in prices in a sustainable manner and that investor interest creates a permanent price effect. The inflation variable has a positive and significant coefficient in the long term (coefficient: 0.0006, $p<0.01$). This finding shows that nominal stock prices increase with inflation in high-inflationary environments such as Türkiye. However, additional analyses may be required to evaluate the reflection of this effect on real returns. The interest rate has

a negative coefficient in the long term (-0.0032), but it is not statistically significant. This result implies that changes in interest rates do not give a significant direction to stock prices in the long term. This may suggest that the market's interest sensitivity may be weak or that other factors suppress the interest effect.

5. Conclusion

For the purpose of this study, the influence of being listed on the sustainability index on stock prices was investigated through the Fourier Panel ARDL model. These results provide empirical support for the theoretical expectations derived from the information cost hypothesis (Merton, 1987) and the signaling hypothesis, both of which argue that increased transparency and verified sustainability practices reduce information asymmetry and provide a credible market signal. In the short-term part of the model, the dummy variable for sustainability (DUM) has a positive coefficient with a level of significance of 1%. This is a reflection that being included in the sustainability index has a positive short-term effect on stock prices. The long-run persistence of this effect is not established through the nature of the model, but the favorable reaction observed in the short run does provide a significant signal of investor sentiment. This finding suggests that membership in the sustainability index is not just of indicative significance, but also regarded as a financial signal by market participants.

These findings are consistent with many studies in the literature. For example, the meta-analysis conducted by Friede et al. (2015) reveals that the relationship between sustainability and financial performance is mostly positive. A few studies conducted specifically for Türkiye have also indicated that being included in the BIST Sustainability Index can have an impact on stock returns and risk measures. In this context, our study provides an empirical contribution to the literature and also confirms the existence of this relationship in the banking sector. Unlike several earlier studies on Türkiye that report limited or insignificant market reactions, the short-term positive effect identified in this study suggests that banks may exhibit a distinct response pattern due to their regulatory visibility and greater investor sensitivity to governance-related signals.

The findings regarding the other independent variables of the model are also valuable in terms of understanding market dynamics. Logarithmic trading volume (ln_volume) has positive and significant effects in both the short and long term. This result shows that the increase in trading volume has both temporary and permanent effects on prices. Increased liquidity can contribute to the upward movement of stock prices by supporting market depth and the effectiveness of price formation. In addition, high trading volume is generally considered an indicator of investor interest and is associated with positive price movements.

The inflation variable is not significant in the short term, but has a positive and significant coefficient in the long term. This situation shows that nominal stock prices tend to increase in inflationary environments. This finding suggests that investors, especially in countries with high inflation rates such as Türkiye, consider stocks as a hedge against inflation. However, the reflections of this effect on real returns should be evaluated separately.

The interest rate was not found to be significant neither in the short term nor in the long term. Although this situation is a result that may theoretically create a surprise, the effect of interest rates on stocks in emerging markets such as Türkiye may not be direct and clear. Especially in periods when the relationship between policy rates and market rates is weak, such results can be expected. It should also be kept in mind that investors are more sensitive to variables such as exchange rates, inflation expectations, and political risk rather than interest rate changes in their decision-making processes.

The fact that the Fourier terms (SIN and COS) of the model are significant indicates that the series contain structural breaks and that these breaks are successfully integrated into the model. This structure requires models to be more flexible in economies open to economic fluctuations and policy changes such as Türkiye. The inclusion of Fourier terms provides flexibility superior to traditional trend components and increases the predictive power of the model.

The findings of this study have various implications for both policy makers and company managers. First of all, it has been determined that being included in the sustainability index has a positive effect on stock prices. This finding reveals that companies can achieve not only environmental and social contributions but also an increase in market value if they increase their sustainability practices. Consistent with signaling theory, strengthening the credibility and transparency of sustainability reporting may enhance the positive market perception associated with index membership. Likewise, in line with the information cost hypothesis, more systematic ESG disclosure and reliable verification mechanisms can further reduce information asymmetry and support investor confidence. Therefore, sustainability policies should no longer be considered only within the framework of corporate social responsibility, but also as a direct financial strategy element.

On the regulatory side, it can be suggested that Borsa Istanbul should be more transparent and encouraging in the processes of creating and updating sustainability indexes. Considering the effects of being included in the index on investor interest and stock performance, the comprehensiveness and scope of influence of such indexes can be increased. In addition, in order to reinforce the public and investors' trust in these indexes, whether companies fulfill sustainability criteria should be regularly audited and reported.

From the investors' perspective, the findings that companies that comply with sustainability criteria gain advantages in their stock performances reveal that investment strategies for such companies should be supported. The concept of

ethical investment is no longer just a social choice, but also a rational financial strategy.

There are certain limitations to this study. First, the analysis is restricted to the banking sector, and the impact of sustainability index inclusion may vary across different industries. In addition, the sustainability dummy captures only whether a bank is included in the index and does not provide a detailed assessment of the firm's actual sustainability performance. This limitation may reduce the ability of the model to fully reflect how variations in sustainability practices influence the effect of index membership over time.

Future studies may extend the analysis to different sectors, incorporate firm-level ESG scores or carbon footprint indicators, or examine crisis periods such as COVID-19 to better understand how sustainability-related signals are valued under varying market conditions.

In conclusion, the findings of this study clearly demonstrate that inclusion in the sustainability index exerts a positive effect on bank stock prices. Furthermore, variables such as trading volume, inflation, and structural breaks are also found to play a significant role in market pricing. The ineffectiveness of the interest rate indicates that pricing behavior in emerging markets may deviate from classical theories. Overall, the results reinforce theoretical expectations by demonstrating that both signaling and information-cost mechanisms can be relevant channels through which sustainability commitments influence market valuation.

Sustainability-based financial structures make it possible not only to achieve environmental and ethical goals but also to increase market performance. Therefore, both the private sector and public authorities should prioritize sustainability-oriented policies. The findings of the research show that these strategies are positively priced by investors. Therefore, sustainability is no longer just a social responsibility, but also a value creation strategy.

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Appendices

Appendix 1: Cross-Sectional Dependence Test Results

VARIABLES	CD-Test	P-value
Lnbist	61.619	0.000
Lnvolume	44.569	0.000
Inflation	72.746	0.000
Interest	72.746	0.000

Appendix 2: Homogeneity Test Results

VARIABLES	Delta	P-value
	73.880	0.000
Adjusted	75.436	0.000

Appendix 3: Estimation Results of the FARDL(1, 2) Model

VARIABLES	PMG Model
Short Run	
EC	-0.0798***
	(0.0256)
Δln_volume	0.0287**
	(0.0129)
Δln_volume_{t-1}	-0.0305***
	(0.0088)
DUM	0.0692***
	(0.0116)
SIN	0.0243
	(0.0222)
COS	0.0778***
	(0.0149)
Constant	-0.1406***
	(0.0380)
Long run	
ln_volume	0.3648***
	(0.0517)
Observations	1305

*** p<0.01, ** p<0.05, * p<0.1