BMIJ
ISSN: 2148-2586

bmij (2026) 14 (1):143-161
doi: https://doi.org/10.15295/bmij.v14i1.2690

Research Article

The role of ESG indices on stock market dynamics from a green finance perspective: An ARDL bounds testing approach for Türkiye

Yeşil finans perspektifinden ESG endekslerinin borsa dinamikleri üzerindeki rolü: Türkiye örneği

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Abstract

This study emphasises the growing importance of Environmental, Social and Governance (ESG) criteria in both global and national financial markets by analysing the short- and long-run relationships between the MSCI Emerging Markets Select Index (MSCI EM SI), the Borsa İstanbul Sustainability Index (XUSRD) and the Borsa İstanbul 100 Index (XU100). The integration of ESG principles into financial markets has transformed how investors assess risk and return, becoming even more critical following recent global crises such as climate change, geopolitical instabilities and the COVID-19 pandemic. Consequently, both international and national ESG indices have emerged as key indicators supporting the transition to sustainable financial assets, especially for developing economies. This study employs an empirical analysis using the ARDL Bounds Testing Approach with monthly closing data for the selected indices. The findings reveal no significant short- or long-run relationship between the MSCI EM SI and the XU100 Index. Conversely, the results indicate that the XUSRD Index exhibits a statistically significant interaction with the XU100 Index in both the short- and long-run.

Keywords: ESG Stock Indices, ARDL Bounds Testing Approach, MSCI EM SI, XUSRD, Financial Markets

Jel Codes: G15, Q56, G32, C22, G10

Öz

Bu çalışma, MSCI Gelişmekte Olan Piyasalar Seçim Endeksi (MSCI EM SI), Borsa İstanbul Sürdürülebilirlik Endeksi (XUSRD) ve Borsa İstanbul 100 Endeksi (XU100) arasındaki kısa ve uzun vadeli ilişkileri analiz ederek, hem küresel hem de ulusal finans piyasalarında Çevresel, Sosyal ve Yönetişim (ESG) kriterlerinin artan önemini vurgulamaktadır. ESG ilkelerinin finans piyasalarına entegrasyonu, yatırımcıların risk ve getiriyi değerlendirme biçimini dönüştürmüş ve iklim değişikliği, jeopolitik istikrarsızlıklar ve COVİD-19 pandemisi gibi son küresel krizlerin ardından daha da kritik hale gelmiştir. Sonuç olarak, hem uluslararası hem de ulusal ESG endeksleri, özellikle gelişmekte olan ekonomiler için sürdürülebilir finansal varlıklara geçişi destekleyen temel göstergeler olarak ortaya çıkmıştır. Bu çalışmada, seçilen endekslerin aylık kapanış verileri kullanılarak ARDL Sınır Testi Yaklaşımı ile ampirik bir analiz yapılmıştır. Bulgular, MSCI EM SI ile XU100 Endeksi arasında kısa veya uzun vadede anlamlı bir ilişki olmadığını, buna karşılık XUSRD Endeksi'nin kısa ve uzun vadede XU100 Endeksi ile istatistiksel olarak anlamlı bir etkileşim gösterdiğini ortaya koymaktadır.

Anahtar Kelimeler: ESG Hisse Endeksleri, ARDL Sınır Testi Yaklaşımı, MSCI EM SI, XUSRD, Finansal Piyasalar

JEL Kodları: G15, Q56, G32, C22, G10

Submitted: 31/12/2025

1st Revised: 21/02/2026

2nd Revised: 27/02/2026

3rd Revised: 3/03/2026

Accepted: 8/03/2026

Online Published: 25/03/2026

Citation: Armağan, İ.Ü., The role of ESG indices on stock market dynamics from a green finance perspective: An ARDL bounds testing approach for Türkiye, bmij (2026) 14 (1):143-161, doi: https://doi.org/10.15295/bmij.v14i1.2690

Introduction

The increasing salience of sustainability in global financial markets has prompted profound changes in how investors evaluate risk and return. The integration of Environmental, Social and Governance (ESG) principles into investment frameworks reflects a structural shift in the priorities of financial actors. ESG is no longer perceived as merely a secondary factor; rather, it has become a fundamental determinant of long-term market stability and corporate accountability. ESG practices, which emphasise environmental stewardship, social inclusiveness and transparent governance, function both as a protective mechanism against systemic risks and as a supportive element for long-term value creation. Therefore, financial markets worldwide are increasingly pivoting toward ESG indices as benchmarks that steer capital toward a sustainable direction.

The necessity of ESG-based investment approaches has become increasingly evident following recent global crises, including climate change, geopolitical instability, and the COVID-19 pandemic. These crises have exposed the fragility of conventional market structures and compelled financial investors to redirect capital toward more resilient assets amid environmental, social, and regulatory pressures. This trend has amplified demand for indices that track companies that adhere to ESG criteria, thereby enabling capital markets to distinguish sustainable financial assets from others. Within this global framework, indices such as the Morgan Stanley Capital International Emerging Markets Selection Index (MSCI EM SI), which evaluate companies operating in developing economies, assume a critical role. These indices not only enhance transparency but also provide an effective mechanism for institutional investors to channel funds into sustainable assets.

Similar dynamics are observable at the national level. In Türkiye, the Borsa Istanbul Sustainability Index (XUSRD) has been developed to highlight companies that adopt ESG practices aligned with global standards. The XUSRD enhances the visibility of these firms and strengthens investor confidence by demonstrating their commitment to long-term sustainability goals. This is particularly crucial for developing economies, as integration into global financial markets necessitates adherence to international sustainability benchmarks. A comparison of the XUSRD's performance with global ESG indices, such as the MSCI EM SI, demonstrates the extent to which the Turkish capital markets are integrated into global sustainable finance dynamics. Nevertheless, conventional indices like the BIST100 (XU100) continue to play a dominant role in investment decisions and remain the primary indicator of national stock exchange performance.

The existing literature extensively examines the impact of ESG criteria on financial performance. However, empirical studies examining how a traditional stock market in a developing economy reacts simultaneously to both global and national ESG indices remain quite limited. Based on this research gap, the primary research question of this study is: "Are the short and long-run dynamics of the conventional market indicator, the BIST100 index, driven more strongly by global ESG trends (MSCI EM SI) or by national sustainability factors (XUSRD)?" Accordingly, the primary objective of this study is to investigate the dynamic relationships among these three indices. The analysis utilises monthly closing prices for all indices and empirically examines these relationships using the ARDL Bounds Testing Approach. By filling this identified gap, the study aims to provide an original contribution to the green finance literature. First, it offers a comprehensive and multi-scale assessment by simultaneously examining the international and national dimensions of sustainability alongside a traditional market index. Second, from a methodological perspective, it systematically models the short-term shock-adjustment processes and the long-term equilibrium relationships among these indices within a single model framework. Ultimately, the findings of this study, which reveal how sustainability interacts with conventional market performance, are expected to provide valuable and significant insights for policymakers, capital market participants, researchers and the academic literature.

Environmental, social, governance (ESG) indices

Environmental, Social and Governance (ESG) indices are regarded as one of the pillars of sustainable investment in global financial markets. These indices aim to deliver financial returns while incorporating environmental, social, and governance factors into investment strategies. On the environmental dimension, reducing carbon emissions and investing in renewable energy, with a focus on ensuring the sustainable and effective exploitation of natural resources; on the social dimension, labour rights, gender equality, and consumer protection gain importance. From a governance perspective, transparency, ethical standards and principles of corporate governance play a critical role. Thus, ESG indices constitute a vital tool that measures firms' long-term sustainability performance, diversifies investors' risk management strategies and enhances trust in financial markets.

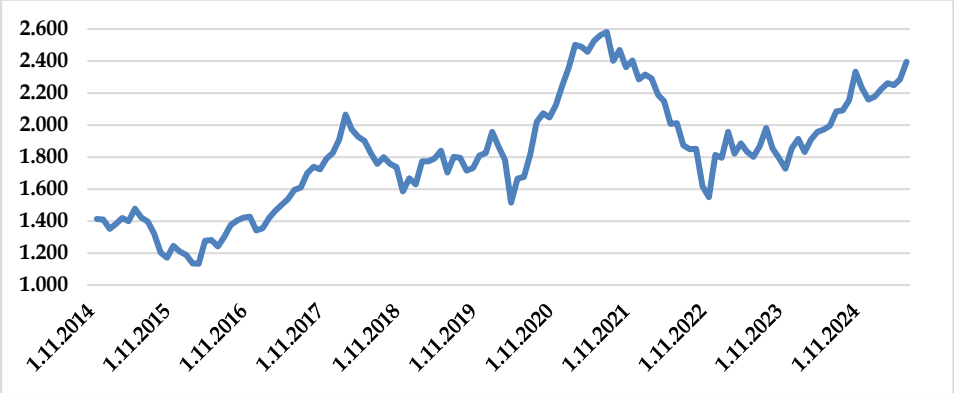
Since the 2008 global financial crisis, ESG indices have rapidly expanded, facilitating investors' shift in focus from short-term gains to strategies aimed at long-term value creation. While conventional indices experienced abrupt fluctuations during periods of crisis, ESG indices exhibited relatively more resilient performance. This underscores that sustainable investment is not merely an ethical preference but also a rational financial strategy. The growing role of ESG criteria in shaping global capital flows has also created a significant advantage for attracting investment into developing economies.

In Türkiye, ESG indices contribute to the internationalisation of the country's financial markets and to its restructuring in green finance. Particularly in light of the European Union's Green Deal and global carbon-neutrality objectives, companies operating in Türkiye that comply with ESG criteria not only increase international investor interest but also support the country's sustainable development goals. Therefore, ESG indices are not just a factor influencing investor decisions but also a strategic policy tool accelerating economic transformation.

Morgan Stanley Capital International Emerging Markets Selection Index (MSCI EM SI)

MSCI EM SI is a global index constructed by MSCI. Companies operating in emerging markets are selected into the index from the MSCI EM Index based on their ESG performance. The index includes large and medium-sized firms from 24 emerging economies, including Türkiye. It has been calculated since 2007 (MSCI, 2025).

The graph of the index's monthly closing values from November 2014 to July 2025 is presented in Graph 1. The results demonstrate that, except for 2015, 2018, 2021, and 2022, the index's annual performance remained positive. During the period examined, the index reached a high of 2,581.61 and a low of 1,133.31.



Graph 1: Monthly Closing Data for the MSCI EM SI Between Nov. 2014 and July 2025

The evidence from the left-hand side of Figure 1, which illustrates the country weights of the index, shows that China accounts for 32,9%, Taiwan for 25,88%, India for 13,77%, South Korea for 5,8%, South Africa for 4,81%, and other countries collectively for 16,84%. It is noteworthy that almost 60% of the index is composed of China and Taiwan (MSCI, 2025).

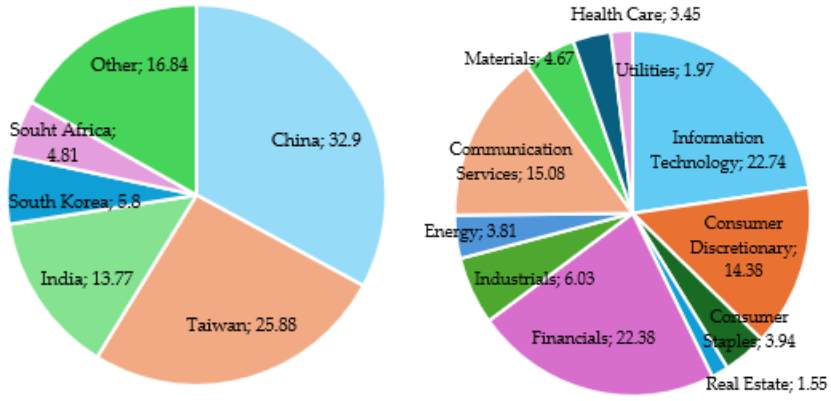


Figure 1: MSCI EM SI Country and Sector Weights (%)

As shown in the right panel of Figure 1, the sectoral weights of the index are presented. The index is composed of companies from various countries, including HDFC Bank (India), Taiwan Semiconductor MFG (Taiwan), Alibaba Group Holding (Hong Kong) and Tencent Holdings Ltd. (China). The sectoral distribution indicates that 22,74% of the index is comprised of information technology, 22,38% of

financials, 15,08% of communication services and 14,38% of consumer discretionary, reflecting the dominance of leading industries (MSCI, 2025).

The MSCI EM SI provides financial investors with an evaluation mechanism that considers not only financial performance but also sustainability criteria. In emerging economies, where capital markets frequently experience volatility and uncertainty, indices such as the MSCI EM SI establish a sustainability-oriented framework to mitigate these risks. Consequently, the MSCI EM SI plays a critical role in directing global funds toward emerging markets.

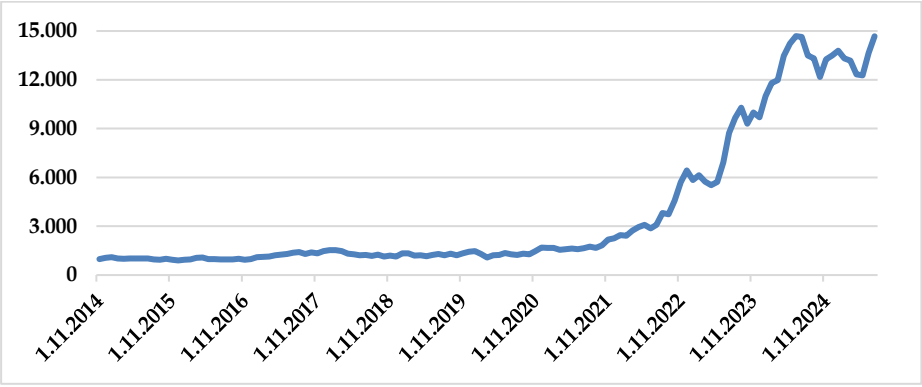
The growing interest of global investors in ESG criteria renders the MSCI EM SI attractive for international portfolio diversification. By highlighting firms with high ESG scores, the index encourages investments with strong long-term value-creation potential. Furthermore, companies with strong ESG performance have shown greater resilience during crises than their traditional competitors. This underscores that the MSCI EM SI is not merely an index but also a tool that institutionalises sustainability-based investment approaches globally.

From a Turkish perspective, the importance of the MSCI EM SI lies in its role in enhancing the international financial visibility of domestic firms. Turkish firms that comply with ESG criteria and are included in this index have greater potential to attract foreign capital. Furthermore, Türkiye's green finance strategies are increasingly aligned with the international financial system through the opportunities offered by such indices. Accordingly, the MSCI EM SI functions not simply as a tool for managing risks in emerging markets but also as a crucial mechanism supporting the vision of sustainable growth.

Borsa Istanbul Sustainability Index (XUSRD)

XUSRD Index is a national index that evaluates leading companies operating in Türkiye based on ESG criteria. It is one of the ESG indices traded on Borsa Istanbul. The index was established in November 2014. According to Borsa Istanbul data as of July 2025, the index includes 3,962,767 investors and has a market capitalisation of 8,599.66 billion TL. Moreover, it comprises 89 companies aligned with ESG standards, including Akbank, Koç Holding, Yapı ve Kredi Bankası, Tüpraş, Turkish Airlines, Sabancı Holding, Turkcell, Ereğli Iron & Steel, Aselsan, and Iş Bankası (C).

At inception, the index was set at 980.20. During the examined period, the index reached a maximum of 14,687.56 and a minimum of 898.80 (Borsa Istanbul, 2025). Graph 2 presents the index constructed from monthly closing values from November 2014 to July 2025. The findings indicate that the index has attained value rapidly, particularly after 2020.



Graph 2: Monthly Closing Data for the XUSRD Between Nov. 2014 and July 2025

The index incorporates constituents from multiple sectors of the economy. Specifically, 21.4% of the index consists of banks, 14.9% of holding companies and investment companies, 10.9% of transportation and storage, 9.3% of chemicals, pharmaceuticals, petroleum and plastic products, 7.8% of defence, 6.3% of machinery, electrical equipment, metal goods and vehicles, 5.3% of telecommunications and 24.1% of other sectors. It can be seen that financial institutions and holding companies together account for 36% of the index.

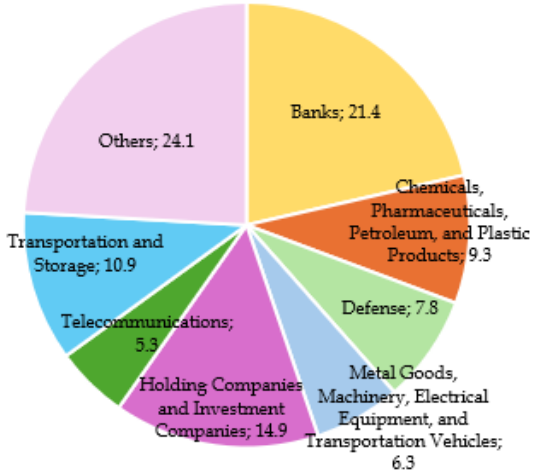


Figure 2: XUSRD Sector Weights (%)

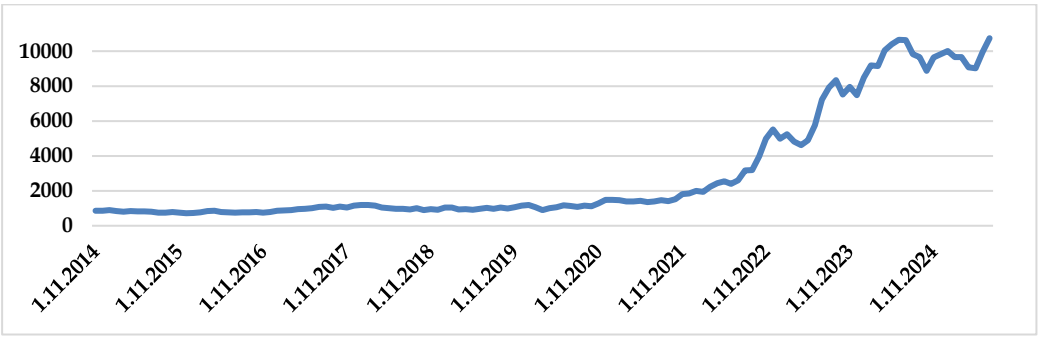
XUSRD Index aims to integrate the Turkish capital markets with global sustainability standards. The primary objective of XUSRD is to transparently measure companies' performance in environmental sensitivity, social responsibility and corporate governance, thereby enabling investors to make informed decisions. In line with this, XUSRD fosters a sustainability-oriented perspective among both investors and corporations.

The firms included in the index are characterised by robust financial performance coupled with sustainable business practices. This feature increasingly encourages financial investors to incorporate ESG factors into their risk management strategies. In particular, the prioritisation of ESG criteria in global fund investment preferences provides companies listed in XUSRD with a strategic edge in global markets. Moreover, the index significantly contributes to the institutionalisation of sustainability awareness in Türkiye and supports the development of more transparent corporate reporting standards.

Within the framework of green finance, XUSRD constitutes a strategic instrument for the sustainable transformation of Türkiye's capital markets. This index not only guides the decisions of financial investors but also allows policymakers to design capital market regulations in an ESG-oriented manner. Therefore, XUSRD acts as a key driver in integrating Türkiye into international capital markets and contributes to building a financial market coherent with the country's sustainable development goals.

Borsa Istanbul 100 Index (XU100)

XU100 Index has been traded on Borsa Istanbul since January 1986. The index is composed of companies selected according to criteria periodically determined. As of July 2025, based on Borsa Istanbul data, the index has 4,808,701 investors and a total market capitalisation of 10,075.06 billion TL (Borsa Istanbul, 2025). Graph 3 provides the monthly closing values of the XU100 Index for the examined period. During this period, the index recorded a high of 10,743.20 and a low of 717.27.



Graph 3: Monthly Closing Data for the XU100 Between Nov. 2014 and July 2025

When examining the sectoral distribution of the XU100 Index, 17% consists of banks, 13.5% of holding companies and investment companies, 9.2% of retail trade, 8.3% of chemicals, pharmaceuticals, petroleum, and plastic products, 6.5% of defence, 6.4% of telecommunications, and 29% of other sectors. Figure 3 presents the sectoral weights (%) of the XU100 Index (Borsa Istanbul, 2025). The composition of the index reflects the sectoral dynamics of the Turkish economy, particularly by demonstrating the dominance of the banking and industrial sectors.

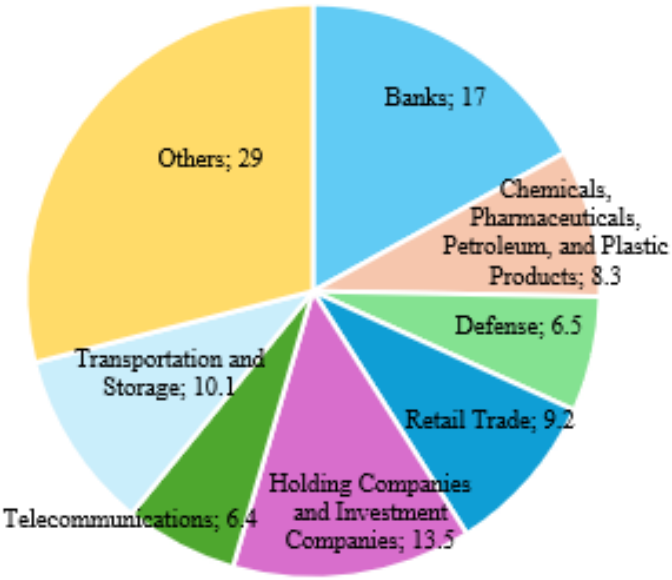


Figure 3: XU100 Sector Weights (%)

The XU100 Index is the broadest indicator of the Turkish capital markets, serving as a benchmark for the most liquid and highest market-cap companies. Serving as a benchmark for monitoring Türkiye's financial markets, this index serves as a critical reference point for understanding investor behaviour and overall market trends. While the XU100 functions as a fundamental indicator of Türkiye's economic outlook for international financial investors, it also reflects economic expectations and market confidence for domestic investors. Since the 2000s, with the intensification of globalisation in financial markets, the XU100 Index has become one of the most tangible indicators of the impact of global capital flows on the Turkish market. Beyond being a mere reflection of market capitalisation, the XU100 Index provides insights into Türkiye's economic stability, political risks and sensitivity to global financial fluctuations. While losses recorded during global financial crises reveal the vulnerabilities of the Turkish economy, the upward trend in the index during periods of accelerated capital inflows points to the potential for economic growth. In light of this, the XU100 Index serves as a bridge between global financial markets and the Turkish economy, playing a significant role in investors' risk and return analyses.

From a green finance standpoint, the significance of the XU100 Index lies in its ability to facilitate comparisons with ESG indices. While the XU100, as a traditional index, strongly reflects short-term market performance, ESG indices measure long-term, sustainability-oriented performance. This comparison provides an important framework for interpreting the future trajectory of Turkish capital markets. As ESG criteria increasingly gain importance, companies in the XU100 Index that strengthen their sustainability policies will not only enhance their access to international capital flows but also reinforce the index's long-term stability. Consequently, the XU100 Index serves as a key reference point for understanding how traditional market dynamics interact with the ESG-based transformation of financial markets.

Literature review

Arslan et al. (2025) applied second-generation panel cointegration and panel causality analyses, which account for cross-sectional dependence and heterogeneity, to data for the 2013-2022 period for 22 companies listed on the BIST 30 Index. The panel cointegration findings demonstrate a significant long-run relationship between ESG dimensions and companies' systematic risk levels. Furthermore, while a short-run unidirectional causality was detected running from environmental and social scores to systematic risk, a bidirectional dynamic interaction was determined between the corporate governance score and systematic risk.

Aykut (2025) investigated risk spillovers and dynamic connectedness between Brent crude oil prices and the XUSRD using daily data for the 2015-2025 period. In the analysis, the Granger causality test, the Quantile-on-Quantile regression, and the Time-Varying Parameter Vector Autoregression methods were applied. The findings demonstrate that, in the short run, there is a unidirectional, statistically significant causal relationship running from Brent crude oil prices to the XUSRD at the 3rd, 5th, and 6th lag levels. In contrast, the index does not affect oil prices. The QQR analysis reveals that extreme price fluctuations in energy markets create asymmetric effects on the sustainability index. Furthermore, the

TVP-VAR results prove that Brent crude oil assumes a clear and stable shock transmitter role on the index, single-handedly driving the pairwise risk transmission with a rate of 96.5%

Başkaya (2025) investigated the short- and long-run dynamic relationships between the BIST Sustainability Index and the BIST100, S&P500, Dow Jones Sustainability Index, S&P Green Bond Index, and Consumer Price Index, employing the ARDL Bounds Test and Toda-Yamamoto causality analysis, using monthly data from the November 2014 to January 2024 period. The ARDL results reveal that the BIST Sustainability Index has a statistically significant and positive interaction with the BIST100, the main national market indicator, while exhibiting a strong negative relationship with the S&P Green Bond Index. The ECM findings indicate that approximately 8.9% of deviations from the long-run equilibrium caused by shocks are corrected each month, and the system returns to equilibrium within approximately 11 months. Furthermore, the Toda-Yamamoto results demonstrate unidirectional causality from the XUSRD to the global-scale SPUSGRN and DJSI indices.

Duran (2025) investigated the relationships between sustainability indices and macro-level uncertainties. The study focused on the DJSI and STOXX indices. It utilised monthly data from 2015 to 2022. Four specific uncertainties were examined. These are ESG, the global energy market, crude oil prices and climate policy. The study presented long-run ARDL findings. These findings show a positive association between the DJSI and ESG uncertainty. The DJSI is also positively associated with climate policy uncertainty. Conversely, the STOXX index is negatively affected by ESG uncertainty. However, it is positively influenced by climate policy uncertainty. Furthermore, the study conducted Toda-Yamamoto and TVGC analyses. These analyses reveal that sustainability indices are not merely passive instruments. They do not simply react to changes in climate or ESG policies. Instead, they also anticipate uncertainties in the energy and oil markets.

Gülcemal (2025) examines the return relationship between eight ESG indices using the TVP-VAR method. It shows that ESG stock indices in Canada, the U.S., and the UK act as net transmitters of return connectivity, while those in South Korea, China, India, Japan, and Indonesia act as net receivers. An additional finding is that investor interest in ESG is a factor affecting the correlation in returns among ESG stock indices. That high interest in ESG leads to lower returns and lower correlation. For this reason, when making strategic decisions on ESG investments, investors should also evaluate the impact of their ESG interests on market dynamics.

Çetin et al. (2024) examine the relationship between ESG standards and the financial performance of 26 firms listed on the XUSRD Index using panel data. The results show that ESG factors have a positive impact on ROE, AGR, NPM, and ROA, while negatively affecting MBR.

Çakmak and Çalış (2024) examine the effect of ESG standards on stock market performance for companies listed on the Borsa Istanbul Sustainability Index that scored above and below 70 points on the ESG scale. The results of the analysis, conducted using Spearman's correlation, indicate that the sustainability performance of the companies examined will have a long-term impact on their financial performance.

Shaik and Rehman (2023) investigate the dynamic volatility linkages among S&P ESG stock indices in Europe, the US, Africa, the Middle East, Latin America, and the Asia-Pacific region. The analysis reveals that ESG stock indices in Latin America, the Middle East, and Africa act as transmission channels for shocks, whereas those in the Asia Pacific and the U.S. act as volatility absorbers. Moreover, it shows that bilateral correlations are higher between Latin America, Europe, and the U.S., while they are weaker between the Middle East, the Asia Pacific, and Africa.

Wan et al. (2023) analysed the relationship between returns and volatility across 11 ESG stock indices spanning developed and emerging markets using the TVP-VAR approach. They find a strong relationship between return and volatility among indices. Indices in India and the Asia Pacific show predominantly inward diffusion, while ESG stock indices in North America and Europe show outward diffusion.

Akhtaruzzaman et al. (2022) investigate the relationship between ESG leadership indices and the COVID-19 Media-Coverage-Index (MCI) and reveal that the MCI facilitated the spread of contagion to developed and emerging stock markets during the period. The relationship between MCI and ESG leadership indices became more evident around March and April.

Korkmazgöz et al. (2022) analysed the causal relationships at short- and long-horizon using ARDL and Bounds Testing among the XU100, Bitcoin, BIST Technology, and BIST Finance indices. Their results reveal a long-run correlation between Bitcoin and the BIST Finance index, whereas no such relationship is observed with the XU100 or BIST Technology indices.

Özman (2022) investigated the relationship between the BIST 100 and the BIST Sustainability Index using data from 2014-2022. In the study, the returns, standard deviations, and correlation levels of the indices were analysed. The findings demonstrate that, contrary to the general trend in global and U.S. markets, the standard deviation of the XUSRD index in Turkey is higher than that of the BIST 100 index, and XUSRD returns exhibit greater volatility. Furthermore, it was determined that the XUSRD did not outperform the XU100, particularly in the years 2015 and 2018. Consequently, it was concluded that financial investors should not consider the XUSRD index as a financial hedging tool to mitigate risk in BIST 100 investments.

Rubbaniy et al. (2022) investigate the relationships among selected ESG stock indices, the COVID-19 Fear Index (GFI), the COVID-19 Market Fear Proxy (IDEMV index), and the VIX Index, a measure of market fear. The analysis provides evidence of a positive link between the GFI and ESG indices in the 32–64 day frequency band. Nevertheless, the relationships among all indices and the GFI yield mixed results in the 0-8 day frequency band. A robustness test using the CBOE VIX as an indicator of market fear also confirms that ESG indices do not serve as safe havens.

Sahabi (2023) investigated the effects of sustainability performance on stock returns and stock price volatility using annual data from 2010-2020 for 15 non-financial companies traded on the BIST100 Index. In the study, the combined ESG score and the environmental, social and governance pillar scores published by Refinitiv were incorporated into the panel as the main explanatory variables representing sustainability indicators. In contrast, the ratio of cash flows to sales, financial leverage and firm size were included as control variables. The results of the analyses, which utilised Driscoll-Kraay standard errors, demonstrated that while the combined ESG score has a statistically significant and positive effect on firm stock returns, it significantly reduces stock price volatility. Furthermore, the analysis reveals that the corporate governance score has no statistically significant impact on either financial variable.

Sharma et al. (2022) analyse the causality and spillover effects between the NASDAQ Clean Energy Indices, the NASDAQ Composite Index, and the NASDAQ Global Select Market Composite. They use the Granger causality test and spillover models. They find both of the indices, sustainable and green, showing a two-way causality that affects each other over the long term.

Tian et al. (2022) use the ARDL model to investigate the asymmetric effects of Climate Policy Uncertainty, the Crude Oil Volatility Index, Geopolitical Risks, and Infectious Diseases on stock market volatility and on green bond prices in the United States, Europe, and China. The analysis findings reveal heterogeneity across regions. In the short term, only the Chinese green bond market exhibits asymmetric responses to uncertainty, whereas in the long term, the European market displays stronger asymmetric effects.

Zhang et al. (2022) investigate the relationships among the ESG stock index, carbon emission futures, the green bond stock index, the sustainability stock index, and the renewable energy stock index using the Dynamic Conditional Correlation GARCH approach. The analysis results show that green bonds are volatility absorbers, while carbon emission futures are volatility transmitters.

Karaca et al. (2021) analysed the relationships between the BIST Financial Index and the exchange rate, inflation rate, interest rate, capacity utilisation rate, gold prices and the industrial production index. When relationships were examined using the ARDL approach, it was found that increases in the industrial production index and interest rates had a positive effect on the BIST Financial Index in both the short- and long-term. In contrast, increases in the exchange rate hurt the BIST Financial Index.

Gherghina et al. (2020) investigate financial market linkages during the pandemic period, addressing the Romanian economy. Using daily stock market returns, the ARDL approach and Granger Causality tests were applied. The findings reveal no significant short- or long-run impact of Chinese COVID-19 cases on Romania's stock market. However, new death cases in Italy negatively affected Romania's 10-year bond yields at both horizons, highlighting bonds' greater sensitivity to pandemic news than equities.

Umar et al. (2020) analyse global stock indices comprising companies with the highest ESG performance to investigate whether socially responsible investments are exposed to similar external economic and financial shocks as traditional investments. The results reveal significant and consistent spillover effects among stock indices. In particular, the European sovereign debt crisis, Greece's structural problems and the outbreak of the coronavirus pandemic were found to be influential in this spillover effect.

Data and methodology

The data set used in the study comprises monthly returns from the MSCI EM SI, XUSRD Index, and XU100 Index, covering the period from November 2014 to July 2025. The Turkish Lira (TRY)-denominated data for the XU100 and XUSRD indices are sourced from investing.com, while the U.S. Dollar (USD)-denominated data for the MSCI EM SI are sourced from Morgan Stanley Capital International (MSCI). The USD/TRY exchange rate is sourced from the Electronic Data Distribution System on the Central Bank of the Republic of Turkey's website. And the study does not require ethics committee approval or permissions. The analysis is conducted using EViews 13.

The limitations of the research arise from the analysis being restricted to the MSCI EM SI among global ESG indices, the XUSRD among national ESG indices, and the XU100 among national indices, as well as the specified time period. Furthermore, the analysed period encompasses significant global structural breaks, most notably the COVID-19 pandemic and subsequent macroeconomic shocks. The absence of explicit structural break tests or dummy variables in the analytical framework constitutes a methodological limitation, and given the instability in the diagnostic tests, the findings should be interpreted with caution. Therefore, it is strongly recommended that future studies employ advanced econometric methods that explicitly account for structural breaks. One such approach could involve Fourier-based cointegration tests. Furthermore, evaluating the robustness of these findings using alternative modelling approaches, such as the ARDL-GARCH framework, would be beneficial.

Since the MSCI EM SI series is denominated in USD, while the XU100 and XUSRD are denominated in TRY, the MSCI EM SI is converted into TRY by dividing it by the USD/TRY exchange rate to construct the model. In this way, all series are expressed in the same currency and as the national currency is adopted, the analysis emphasises the perspective of domestic investors. Thus, the USD-TRY exchange rate does not introduce an additional source of volatility into the model. The results of the analysis are expected to have more direct implications for both domestic investors and policymakers. The series and codes used in the analysis are provided in Table 1.

Table 1: Series and Codes

Series	Codes
MSCI EM (Emerging Markets) Selection Index	MSCI EM SI
Borsa Istanbul Sustainability Index	XUSRD
Borsa Istanbul 100 Index	XU100

While the descriptive statistics are presented in their raw levels to reflect the actual market scales, a natural logarithmic transformation was applied to all series before conducting the unit root tests and ARDL estimations. The logarithmic transformation is a standard, highly recommended procedure in financial time-series analysis. Specifically, it compresses the scale of the variables, thereby reducing the sharpness of extreme price fluctuations and mitigating potential heteroskedasticity problems (Gujarati, 1995). In logarithmic specifications, the coefficients admit an elasticity interpretation.

Table 2: Descriptive Statistical Data

Series	Mean	Median	Max	Min	Std Dev	Skewness	Kurtosis	Jarque-Bera	p
MSCI EM SI	281.67	299.20	631.96	59.00	163.99	0.04	1.84	7.30	0.03
XUSRD	3,853.24	1,402.21	1,4687.56	898.80	4,424.94	1.42	3.40	44.52	0.00
XU100	2,997.95	1,144.25	1,0743.20	717.27	3,281.53	1.32	3.07	37.38	0.00

The mean and median of the MSCI EM SI are close to each other, indicating a nearly symmetric distribution. In contrast, for the XUSRD Index, the mean is much higher than the median, suggesting strong right skew. Similarly, the XU100 Index also exhibits a right-skewed distribution. An examination of the maximum and minimum values shows that the MSCI EM SI operates within a narrower price range, whereas the XUSRD and XU100 indices trade within a much wider range. This indicates both high volatility and a strong, long-term upward price trend. Based on the standard deviation values, the MSCI EM SI exhibits the lowest volatility. In contrast, the XUSRD and XU100 indices exhibit high volatility, indicating that Turkish markets are more volatile than the global ESG index.

The MSCI EM SI displays an almost symmetric structure, while the XUSRD and XU100 indices exhibit pronounced right skewness. The MSCI EM SI appears flatter compared to the normal distribution and has a lower probability of extreme values. The XUSRD and XU100 indices, on the other hand, are closer

to the normal distribution and have a higher probability of extreme values compared to the MSCI EM SI. According to the Jarque-Bera test and the corresponding p-values, the hypothesised normal distribution (H_0) for MSCI EM SI, XUSRD, and XU100 has been rejected. Overall, the MSCI EM SI emerges as a more balanced and lower-risk series, with lower volatility and more symmetric distributions. In contrast, the XUSRD and XU100 indices, with their right-skewed distributions and high volatility, appear more speculative and riskier.

According to the Jarque-Bera test and the corresponding p-values, the hypothesised normal distributions for MSCI EM SI, XUSRD, and XU100 have been strongly rejected. The rejection of normality is a highly significant finding, as it highlights the presence of skewness, excess kurtosis, and extreme-value probabilities inherent in financial time series. Analytically, this non-normality indicates that employing standard linear regression models, which rely on strict normality assumptions, could lead to biased or inefficient estimates. Consequently, these distributional characteristics robustly justify the methodological preference for the Autoregressive Distributed Lag bounds testing approach and the Error Correction Model in this study. The ARDL framework is particularly advantageous and appropriate here, as it does not strictly require the underlying series to be normally distributed and can effectively model dynamic short-term interactions and long-term equilibrium relationships even in the presence of non-normal, asymmetric financial shocks.

Additionally, the visual representations of price trends, historical fluctuations, and volatility clustering for the MSCI EM SI, XUSRD, and XU100 indices are presented in Graph 1, Graph 2, and Graph 3, respectively, in the preceding sections. Furthermore, the structural breaks and extreme volatility periods stemming from global macroeconomic shocks are explicitly visualised and analysed through the ARDL Cointegrating Series in Figure 4.

Therefore, the study examines the effects of the MSCI EM SI and the XUSRD Index on the XU100 Index using the Autoregressive Distributed Lag (ARDL) Bounds Testing Approach established by Pesaran et al. (2001). The ARDL model is first estimated, after which the bounds test is conducted to analyse the evidence of a long-term cointegrating relationship among the variables. The approach is utilised to analyse both short-term and long-term relationships between series with different levels of stationarity (Nkoro & Uko, 2016). Before performing the ARDL test, it is necessary to examine whether all series contain unit roots and to conduct a stationarity test. The stationarity test indicates that the mean, variance, and covariance of the series remain constant at all lags. In this way, the validity of the relationships among stationary series can be tested and modelled. Otherwise, modelling non-stationary time series can lead to spurious regression (Gujarati, 1995).

Unit root test

The analysis of unit roots is carried out through the Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1981) and the Phillips Perron (PP) test (Phillips & Perron, 1988) and the stationarity of all variables is tested using the H_0 and H_1hypotheses. In the model, the XU100 Index is the dependent variable, while the MSCI EM SI and the XUSRD Index are the independent variables.

H_0 : The series has a unit root

H_1 : The series has no unit root

The results of the ADF and PP unit root tests, conducted under the specification including both a constant and a trend with lag lengths determined by the Schwarz Information Criterion (SIC), are presented in Table 3.

Table 3: ADF and PP Unit Root Analysis Results

	ADF		**PP**	
Series	**t-stat**	**p**	**t-stat**	**p**
MSCI EM SI	-3.1374	0.1023	-2.1543	0.5105
D(MSCI EM SI)	-8.1958	0.0000	-7.9666	0.0000
XUSRD	-1.3769	0.8631	-1.4545	0.8399
D(XUSRD)	-7.2487	0.0000	-8.7914	0.0000
XU100	-1.0759	0.9282	-1.3122	0.8804
D(XU100)	-7.6053	0.0000	-9.1538	0.0000

Note: Both ADF and PP unit root tests were conducted under the specification including both a constant and a linear trend. The lag lengths for the ADF test were determined based on the Schwarz Information Criterion. The critical values for both tests at the 1%, 5% and 10% significance levels are [-4.03], [-3.45] and [-3.15], respectively.

As indicated by the ADF and PP tests, the MSCI EM SI, XUSRD, and XU100 indices are non-stationary at their level, indicating the presence of a unit root. Therefore, we take the first differences of the series. After differencing, the series D(MSCI EM SI), D(XUSRD) and D(XU100) become stationary, showing no evidence of a unit root. Since all series are stationary at the first difference I(1), they are deemed appropriate for the ARDL Bounds Test. Therefore, while D(XU100) is treated as the dependent variable, D(MSCI EM SI) and D(XUSRD) are used as independent variables. This allows for the examination of both short-term and long-term relationships.

Autoregressive Distributed Lag (ARDL) bounds testing approach

This study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach (Pesaran et al., 2001) to establish the analytical framework. The approach offers several distinct methodological advantages over traditional cointegration techniques, such as the Engle-Granger and Johansen methods. The primary advantage of the ARDL framework is its flexibility regarding the integration orders of the variables. The ARDL approach can be robustly applied regardless of whether the underlying variables are purely I(0), purely I(1), or a mutually mixed structure, provided that no series is integrated at the I(2) level. Furthermore, compared with the Johansen cointegration technique, the ARDL approach exhibits superior statistical properties and yields more consistent estimates in small and finite samples (Pesaran et al., 1995, 1997).

Theoretically, the ARDL method inherently mitigates potential endogeneity problems by appropriately augmenting the model with sufficient lags of both the dependent and independent variables. A fundamental feature of this approach is its ability to simultaneously model both short- and long-run relationships through a single dynamic Unrestricted Error Correction Model utilising Ordinary Least Squares regression. Within this unified framework, the short-run dynamics are effectively captured by the differenced terms of the variables. At the same time, the long-run equilibrium relationships are derived from the lagged level variables. The fundamental assumptions underlying the reliability of this model require that the error terms be serially uncorrelated and homoscedastic, and that the model be structurally stable over time.

In the present analysis, the first-differenced series D(MSCI EM SI), D(XUSRD), and D(XU100) are found to be stationary at I(1), making them appropriate for an ARDL application. The ARDL framework accommodates series integrated at I(0), I(1), while excluding variables at the I(2) level, thereby ensuring methodological consistency and enhancing the reliability of the results (Johansen and Juselius, 1990). Following this procedure, the ARDL model is first specified and estimated, and then the bounds test is conducted to assess the existence of long-run cointegration among the variables. Ultimately, the model is designed to evaluate the influence of ESG indices, D(MSCI EM SI) and D(XUSRD), on D(XU100), which serves as a measure of the Turkish financial markets.

$$D(XU100)_t = \alpha_0 + \sum_{i=1}^{p} \Phi_i \, D(XU100)_{t-i} + \sum_{j=0}^{q} \beta_j \, D(XUSRD)_{t-j} + \sum_{k=0}^{r} \gamma_k \, D(MSCI\ EM\ SI)_{t-k} + u_t$$

$$| \beta_j | < 1 \qquad (1)$$

Table 4 presents the ARDL test results based on the Akaike Information Criterion (AIC), and the final lag combination forms the ARDL(1,0,1) model. For the dependent variable, there is one lag (p = 1); for the independent variable MSCI EM SI, there is no lag (q=0); and for the independent variable XUSRD, there is one lag (r=1).

The model shows that D(XU100(-1)), the previous month's change in the XU100 Index, explains approximately 34% of the current month's change, indicating a significant and positive momentum effect. The short-run impact of D(MSCI_EM_SI), on the other hand, is negative but insignificant, suggesting that it has no direct impact on market returns in the near term. A 1% change in the D(XUSRD) index corresponds to an approximately 0.76% positive change in the XU100 Index, indicating a strong and significant relationship. However, the increase in the D(XUSRD(-1)) index in the previous month reduces the current month's market return, creating a correction effect.

Table 4: Test Results of ARDL (1,0,1) Model

Variable	Coefficient	Std. Error	t-stat	p
D(XU100(-1))	0.3391	0.0859	3.9493	0.0001
D(MSCI EM SI)	-0.0495	0.2211	-0.2241	0.8230
D(XUSRD)	0.7624	0.0118	64.8399	0.0000
D(XUSRD(-1))	-0.2734	0.0661	-4.1383	0.0001
c	1.9237	5.0703	0.3794	0.7050
R- squared	0.9738	**AIC**	10.8429	
Adj. R- squared	0.97294	**SC**	10.9549	
F statistic	1.133.64	**HQ**	10.8884	
Prob (F statistic)	0.0000	**DW stat**	1.8279	

When the model statistics are analysed, the R^2 value is 0.9738. The result shows that short-term variables explain a very high proportion of the changes in the XU100 Index. The F-statistics further support this finding, indicating the model's statistical significance. According to the Durbin-Watson test results, there is no autocorrelation. Therefore, within the short run, adjustments in the XUSRD Index exhibit a strong and significant positive relationship with XU100 market returns, whereas the short-term effect of MSCI EM SI is determined to be statistically insignificant. In addition, the XU100 Index itself is positive and significant in its own lagged value, indicating that index movements tend to persist in the short run. However, the negative parameter for the lagged value of the XUSRD Index suggests that if the index increased excessively in the previous month, a correction effect may occur in the subsequent month. Following the identification of short-term relationships through the ARDL test, the long-term cointegration relationship is examined using the Bounds Test.

Bounds test

The Bounds test, recommended by Pesaran et al. (2001), is the most commonly used methodology for assessing the existence of a long-run relationship between series. This technique is designed to assess whether there is a cointegration relationship between dependent and independent variables. Thus, it provides evidence of a potential long-term equilibrium. Analyses test the H_o and H_1 hypotheses.

H_o: There is no long-term relationship among the level values

H_1: There is a long-term relationship among the level values

Table 5: Bounds Test Results

F-statistic Value	14.821					
Bounds Test Critical Values	**10%**		**5%**		**1%**	
Sample Size	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
Asymptotic	2.630	3.350	3.100	3.870	4.130	5.000

Comparing the test statistic with critical values shows that the F statistic is 14.821, while the 5% critical values are 3.100 for the lower limit I(0) and 3.870 for the upper limit I(1). The value of 14.82 is well above the 5% upper limit and even exceeds the 1% upper limit of 5.000. Therefore, the null hypothesis (H_0), which indicates that there is no long-term relationship between the level values, is rejected. There is a long-term cointegration relationship between the XU100, XUSRD and MSCI EM SI series. This finding indicates long-term cointegration between the series and a stable equilibrium relationship. As a result, the model's coefficients reflecting short-term adjustments and long-term equilibrium are estimated using the Error Correction Model, and the speed of short-term adjustment is determined.

Error correction model (ECM)

The Error Correction Model (ECM) is an approach that enables the simultaneous modelling of short-term dynamics and long-term equilibrium relationships (Engle & Granger, 1987). By incorporating an Error Correction Term (ECT) into the model, the adjustment speed, which indicates the rate at which short-term deviations are corrected to return the system to its long-term equilibrium in the subsequent period, is estimated. Econometrically, a negative, statistically significant ECT coefficient confirms the existence of a stable long-run cointegration relationship among the variables and indicates that any

short-term shocks will converge back to equilibrium. This mechanism demonstrates market resilience; it measures how rapidly the market absorbs structural shocks, financial crises, or global volatility and returns to its fundamental trend.

Table 6: ECM and Conditional ECM Results

Variable	Coefficient	Std. Error	t-stat	p
D(MSCI EM SI)	-0.0495	0.2211	-0.2241	0.8230
D(XUSRD)	0.7624	0.0118	64.8399	0.0000
ECT(-1)	-0.6609	0.0848	-7.7938	0.0000

As shown in Table 6, the estimated coefficient for ECT(-1) is -0.6609 and is highly statistically significant ($p<0.0001$). This finding economically implies that approximately 66% of the disequilibrium caused by an unexpected market shock in the previous month is corrected in the current month. Consequently, it takes roughly 1.5 months for the BIST100 index to fully absorb short-term shocks and restore its long-term equilibrium, reflecting a highly dynamic and resilient market structure. Additionally, the short-run dynamics isolated in the ECM reveal that a 1% change in the differenced XUSRD immediately yields a 0.76% positive impact on the XU100 Index in the current month. In contrast, the short-run impact of the global indicator MSCI EM SI remains statistically insignificant.

Ensuring methodological transparency in accordance with the theoretical framework of the ARDL bounds testing approach requires explicitly outlining how the short- and long-run coefficients are mathematically derived. In the ARDL-based ECM, the immediate short-run impact of a variable is captured by the coefficient of its contemporaneously differenced term. In contrast, the cumulative short-run effect is the sum of its contemporaneous and lagged differenced terms. As presented in the ECM results, the immediate short-run effect of the XUSRD index is 0.7624, and the 1-month lagged effect is 0.4890. Consequently, the cumulative short-run impact is calculated as the sum of these two coefficients, meaning that a 1% increase in the XUSRD Index leads to a cumulative short-term increase of 1.25% in the XU100 Index. Table 7 summarises the model's short-term dynamics.

Table 7: Estimating Short-Term and Long-Term Effects from the ARDL Model

Impact Type	Coefficient	Description
Immediate short-run	0.7624	Effect in the current period
1-month lagged additional effect	0.4890	Additional contribution from the previous month's change
Cumulative short-run	1.2514	Total short-run effect
Long-run	0.7398	Permanent equilibrium effect

Furthermore, the long-run coefficients are mathematically derived from the Conditional Error Correction Regression. According to the ARDL approach, the long-run coefficient of an independent variable is calculated by dividing the coefficient of its lagged level variable by the coefficient of the lagged dependent variable (the Error Correction Term), and then multiplying the result by -1. Applying this exact formula to our estimation results, the long-run coefficient for XUSRD is 0.7399. Similarly, the long-run coefficient for the MSCI EM SI is -0.0750. The systematically calculated long-run cointegration coefficients are reported in Table 8.

Table 8: The Results of Cointegration Coefficients

Variable	Coefficient	Std. Error	t-stat	p
D(MSCI EM SI)	-0.0750	0.3343	-0.2243	0.8229
D(XUSRD(-1))	0.7399	0.0210	35.2673	0.0000
c	2.9107	7.6697	0.3795	0.7050

Table 8 reports the long-run cointegration coefficient results. When examining the cointegrating relationship of the series, the coefficient for MSCI_EM_SI is -0.0750; however, since its p-value is 0.8229, its long-run effect is not statistically significant. On the other hand, the explicitly derived long-run coefficient for the national ESG index (0.7399), with a p-value of 0.0000, demonstrates a statistically significant, positive impact on the long-run performance of the XU100 Index. Therefore, a 1% increase in the XUSRD Index leads to a permanent rise of approximately 0.74% in the XU100 Index in the long

run. These results reveal that the national ESG index strongly and significantly influences long-term market movements in Türkiye, whereas the global ESG index does not.

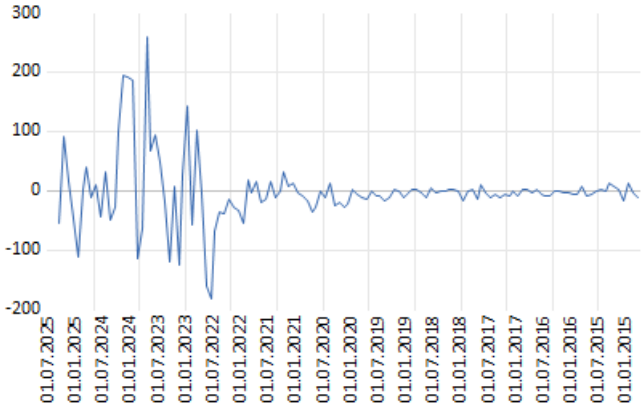


Figure 4: ARDL Cointegrating Series

The cointegrating series graph reveals that the series fluctuates around zero, indicating a tendency to remain in equilibrium state in the long run. The appearance of large deviations in the periods of 2022 and 2024 likely reflects global economic shocks, including post-pandemic volatility, inflationary pressures, and rising interest rates. The subsequent return to equilibrium after 2024 demonstrates the operation of the error-correction mechanism.

Table 9: Statistical Results

Statistics	Value	Statistics	Value
R- squared	0.9832	**AIC**	10.8429
Adj. R- squared	0.982629	**SC**	10.9549
F statistic	1.782.8250	**HQ**	10.8884
Prob (F statistic)	0.0000	**DW stat**	1.8279

The R^2 value indicates that the short-term model explains a substantial portion of the variation in the XU100 Index. The Durbin–Watson statistic of 1.82 indicates no autocorrelation problem, while the p-value of 0.0000 for the F-statistic confirms that the model is statistically significant overall. In addition to the Durbin–Watson statistic, we also perform the Breusch–Godfrey serial correlation LM test to retest the hypothesis of no serial correlation in the model.

Breusch–Godfrey Serial Correlation LM Test

The Breusch–Godfrey Serial Correlation LM test is used to test for autocorrelation in the residuals of the estimated model. The null and alternative hypotheses are defined as follows (Breusch & Godfrey, 1978).

H_0: There is no serial correlation in the model.

H_1: There is serial correlation in the model.

Table 10: Breusch–Godfrey Serial Correlation LM Testing Results

Statistic	t-stat	prob
F-statistic	1.758269	0.1768
Obs*R-squared	3.615713	0.1640
DW stat	1.943355	-

Note: The critical values for the chi^2 distribution at the 1%, 5% and 10% significance levels are 9.21, 5.99 and 4.61, respectively

The results of the Breusch–Godfrey LM test indicate that the model does not present any serial correlation in the residuals. The F-statistic (1.76, p = 0.1768) and the Obs*R-squared (3.62, p = 0.1640) both exceed the 5% significance level, implying that the hypothesis of no serial correlation cannot be rejected. The Durbin–Watson statistic (1.94), which is very close to the benchmark value of 2, further supports the absence of autocorrelation. Additionally, the overall regression's F-statistic of 0.74 (p=0.56) confirms that the residuals behave as white noise.

Therefore, the model satisfies the assumption of independent errors. The Breusch–Godfrey serial correlation LM test indicates no evidence of autocorrelation in the residuals, validating the adequacy of the lag structure and the reliability of the ARDL(1,0,1) specification. To rigorously evaluate the reliability, validity and robustness of the estimated ARDL model, a comprehensive set of diagnostic and stability tests was performed.

Table 11: Diagnostic Test Results for the ARDL Model

Diagnostic Test	Null Hypothesis	Test Statistic	p-value
Breusch-Godfrey LM	No serial correlation	F-stat: 1.758	0.1768
Ramsey RESET	The model is correctly specified	F-stat: 0.847	0.3592
Jarque-Bera	Residuals are normally distributed	JB-stat: 170.95	0.0000*

Note: Due to the inherent excess kurtosis and heteroskedasticity typical of financial time series, the model is estimated using Newey-West (HAC) standard errors to ensure robust inferences.

As shown in Table 11, the Breusch-Godfrey LM test confirms the absence of serial correlation. Furthermore, the Ramsey RESET test yields a p-value of 0.3592, strongly confirming that the model is correctly specified and free of omitted-variable bias. As is common with high-frequency financial time series, initial diagnostic tests indicated heteroskedasticity and non-normal residuals, as evidenced by the Jarque-Bera test ($p< 0.05$). Theoretically, non-normality of the error terms could compromise the reliability of hypothesis testing by biasing standard errors and t-statistics. However, given the sufficiently large sample size in this study, the OLS estimators remain asymptotically normal and consistent under the Central Limit Theorem. Furthermore, to rigorously eliminate any potential adverse effects of these distributional deviations and heteroskedasticity on the statistical inference, the ARDL model was estimated utilising the Newey-West (Heteroskedasticity and Autocorrelation Consistent, HAC) covariance estimator. The use of the HAC approach provides consistent standard errors in the presence of heteroskedasticity and autocorrelation, thereby supporting the reliability of statistical inference.

Finally, the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests were conducted to assess the model's structural stability. The CUSUM plot (Figure 5) remains within the 5% critical bounds, suggesting the general stability of the estimated coefficients over the sample period. However, the CUSUMSQ plot indicates instability in variance, particularly during the highly volatile global economic shock period of 2022–2024, suggesting that the model does not exhibit full structural stability across the entire sample. It should be acknowledged that while the Newey–West (HAC) estimator provides consistent standard errors in the presence of heteroskedasticity and autocorrelation, it does not inherently address structural breaks or parameter instability. Since the HAC approach corrects the covariance matrix without accounting for potential structural shifts, the empirical findings should be interpreted with appropriate caution.

Overall, the empirical findings indicate that the national ESG index is positively and statistically significantly associated with the XU100 Index in the long run, whereas the global ESG index is not. In the short run, the XUSRD Index positively influences market returns both contemporaneously and with a lag, while the MSCI EM SI shows no significant short-term impact. The adjustment speed of 66% toward equilibrium indicates that, following market shocks, a substantial portion of the disequilibrium is swiftly corrected. Furthermore, comprehensive diagnostic tests incorporating the Newey-West (HAC) estimator were employed to account for the inherent volatility and non-normality of financial time series. While the results indicate general coefficient robustness, the variance instability detected during global shock periods highlights that the model's structural stability is partial, emphasising the importance of accounting for structural breaks in future analyses.

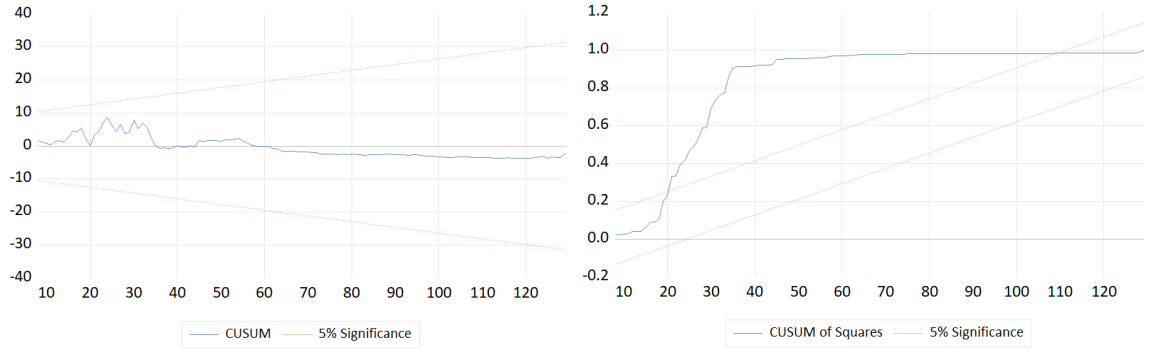


Figure 5: CUSUM and CUSUMSQ Stability Tests

The findings demonstrate that national dynamics more effectively shape sustainability-based financial investments in the Turkish stock market. The strong, stable, and positive relationship between the national ESG index and the market index indicates that sustainability criteria on Borsa Istanbul are increasingly critical and resilient in investor decision-making. Conversely, the lack of impact from global ESG indicators suggests that the Turkish market is only marginally influenced by international ESG trends in both the short- and long-term.

Conclusion and discussion

Over the past decade, global financial markets have placed environmental, social and governance (ESG) principles at the core of investment decisions. Globally, issues such as the scarcity of natural resources, the threat of climate change, biodiversity loss, the lack of corporate transparency, social inequalities, geopolitical tensions, and forced migration have necessitated the structuring of capital markets not solely around profit maximisation but also around a sustainability perspective. In this regard, ESG has emerged as a strategic element for long-term value creation and risk management. Consequently, its importance and position in financial markets are rapidly increasing. In particular, institutional investors are increasingly factoring ESG performance into portfolio selection, while international regulations and market standards support this trend. Turkish financial markets have likewise not remained outside of this global transformation, and financial instruments that measure and present ESG criteria to investors, most notably indices such as XUSRD, have been developed. Within this process, assessing the interaction between international and national indices is critical for optimising investment strategies and enabling policymakers to align sustainability objectives with the dynamics of financial markets.

From the perspective of the relationship between stock indices and ESG, stock indices are significant indicators of a country or region's economic, sectoral, and investor behaviour. Whereas traditional national indices measure the overall performance of the market, thematic indices, such as sustainability indices, select companies based on ESG criteria, thereby providing investors with a specific strategic perspective. At the international level, the MSCI Emerging Markets Selection Index brings together ESG leaders in emerging markets, offering investors a comparative ESG investment opportunity.

Considering these dynamics, the study analyses the short- and long-term relationships between the XU100 Index, XUSRD Index, and MSCI EM SI using the ARDL Bound Test Approach, revealing the extent of interaction between the Turkish stock market and ESG-focused national and global indices. In doing so, the role of ESG investments in both national and international dynamics is evaluated within an econometric framework. The study employs monthly data from November 2014 to July 2025 and applies the ARDL Bounds Testing and ECM. In light of the unit root test findings, all series were found to be non-stationary at the level (I(0)) but stationary at the first difference (I(1)), making the ARDL method applicable for the analysis.

The Bounds test results indicate that the calculated F-statistics exceed both the 5% and 1% upper bound critical values, thereby confirming the presence of a long-run cointegration relationship between the series. Drawing on the estimated long-run coefficients, the national ESG index, XUSRD, exerts a positive and statistically significant effect on the XU100. By comparison, the coefficient for the global ESG index, MSCI EM SI, is not statistically significant. This finding demonstrates that the long-term market dynamics in the Turkish financial market are more responsive to national sustainability performance than to global ESG indicators. The ECM results indicate that approximately 66% of divergences from the long-term equilibrium are corrected in the following period. In the short run, the XUSRD variable has a significant, strong positive impact on XU100, both in its current and lagged values, whereas the short-term effect of MSCI EM SI is insignificant.

The empirical findings from the study exhibit significant similarities and distinct differences compared with current research in the literature, which several underlying market mechanisms can explain. The strong, positive long-run relationship identified between the national sustainability index and the BIST 100 index aligns with Başkaya (2025). Analytically, this strong alignment can be attributed to the increasing regulatory directives by national authorities and the growing awareness among domestic investors, which compel Turkish companies to prioritise local sustainability benchmarks to secure capital access. Similarly, studies emphasising that high ESG scores positively affect financial returns in the Turkish market (Arslan et al., 2025; Çetin et al., 2024; Sahabi, 2023) provide theoretical support for this mechanism, demonstrating that national sustainability criteria have become a fundamental determinant in domestic risk and pricing models.

In contrast, our study diverges from a significant portion of the international literature by revealing that global sustainability indicators (MSCI EM SI) have no significant impact on the national market. While numerous studies employing advanced econometric models demonstrate strong return and volatility

connectedness among global ESG markets (Gülcemal, 2025; Umar et al., 2020; Wan et al., 2023), results suggest that sustainability-themed pricing in the Turkish stock market appears to be shaped in a relatively more isolated manner. In particular, dominant internal dynamics such as high inflation, interest rate shifts, and exchange rate volatility may limit the transmission of global ESG spillovers. Consequently, domestic market dynamics may play a more prominent role than global sustainability shocks in shaping pricing behaviour, potentially reducing international ESG transmission.

Finally, while some research suggests that the XUSRD index exhibits higher volatility and remains an inadequate hedging tool (Özman, 2022), the high adjustment speed of 66% estimated via the error correction model indicates the market's high resilience. This rapid convergence may reflect the market's trading liquidity and information-processing capacity, which appear to facilitate the absorption of short-term deviations and the restoration of long-run equilibrium.

When evaluated economically, it is observed that national dynamics predominantly shape sustainability-based investments in the Turkish stock market. At the same time, global ESG trends exert only a limited influence in both the short- and long-term. Beyond this, the rapid adjustment rate indicates that the market is resilient to shocks.

The academic contribution of this study lies in being one of the few empirical analyses of the effect of ESG criteria on market performance in Turkish financial markets at the national and international levels. The ARDL methodology provides a methodological contribution by allowing the analysis of short- and long-term dynamics among series with different integration orders within a single model framework. Moreover, the demonstration of the dominant effect of the national ESG index on market performance compared to the global ESG index underscores the tendency of ESG investment strategies to be shaped on a national scale in emerging markets.

The analysis also yields several policy recommendations. The results show that the national ESG index has a significant effect on market performance. Therefore, strengthening ESG reporting standards, enhancing corporate transparency, and integrating ESG criteria into Borsa Istanbul's listing requirements are of great importance for sustainability. In addition, to further enhance the impact of national ESG investments on market dynamics, investor awareness programs, such as financial education, information campaigns, and public-private sector collaborations, should be promoted. To foster global ESG integration, cooperation with global ESG data providers and harmonisation of criteria to enable companies to be included in global ESG indices would be beneficial, ensuring that Turkish financial markets' interaction with global ESG indices is not limited and that the potential to attract international financial investors is not constrained.

The findings also provide implications for financial investors. Prioritising companies in the XUSRD Index in their portfolios enables financial investors to pursue ESG-focused national strategies, thereby demonstrating that these companies' performance positively contributes to long-term market returns. Investments aligned with ESG criteria can also be more resilient to market shocks from a risk management perspective. The rapid rate of return to equilibrium in the index indicates that it plays a risk-reducing role, particularly during crisis periods. Furthermore, although the global ESG index has no significant statistical effect in the short or long-term, it continues to serve a strategic function in terms of global ESG trends, capital flows and investor sentiment in global financial markets. Thus, monitoring global ESG indicators and incorporating them into financial portfolios under suitable conditions may prove beneficial.

The research findings highlight the importance of ESG criteria in the Turkish stock market, particularly emphasising the strong impact of the national ESG index on market performance. The limited relationship with global ESG indices suggests that perceptions of sustainability in Turkish financial markets are shaped at the national level. It is considered beneficial for policymakers and investors to formulate their strategies by taking these national sustainability dynamics into account. In this way, a more balanced and resilient financial market structure can be built, aligning financial returns with sustainable development objectives.

The research is expected to provide policy recommendations for policymakers, implications for financial investors, guidance for researchers working on the subject, and contribute to the academic literature.

Peer-review:

Externally peer-reviewed

Conflict of interests:

The author has no conflict of interest to declare.

Grant Support:

The author declared that this study has received no financial support.

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