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DYNAMIC INTERACTIONS BETWEEN GLOBAL RISK INDICATORS AND THE TURKISH STOCK MARKET

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ABSTRACT

In this study, the causal relationships between the Borsa Istanbul 100 (BIST100) index and two key risk indicators Credit Default Swap (CDS) premiums and the VIX index were analyzed using monthly data for the period from October 2008 to December 2024. Within the scope of time series analysis, the stationarity levels of the series were first evaluated using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. Since the variables were found to be integrated of order one I(1) and stationary at their first differences, the Granger causality test was applied. The findings reveal that the Turkish stock market is significantly and unidirectionally influenced by the VIX index, which reflects global risk sentiment, while CDS premiums are influenced by the BIST100 index. This indicates that, in emerging economies such as Türkiye, stock markets are in dynamic interaction with both internal and external risk indicators, offering important implications for investor behavior and policymaking.

Keywords: CDS, VIX Index, BIST100, Granger Causality, Financial Markets, Risk Perception

JEL Codes: C32, C58, E44, F37, G15

KÜRESEL RİSK GÖSTERGELERİ VE TÜRKİYE HİSSE SENETLERİ PİYASASI ARASINDAKİ DİNAMİK ETKİLEŞİMLER

ÖZET

Bu çalışmada, Türkiye finansal piyasasında Borsa İstanbul 100 (BIST100) endeksi ile iki önemli risk göstergesi olan Kredi Temerrüt Takası (CDS) primi ve VIX endeksi arasındaki nedensellik ilişkileri 2008:10–2024:12 dönemine ait aylık veriler kullanılarak analiz edilmiştir. Zaman serisi analizi kapsamında öncelikle serilerin durağanlık düzeyleri ADF ve PP birim kök testleriyle değerlendirilmiştir. Değişkenlerin I(1) birinci farkta durağan halde olması nedeniyle Granger nedensellik testi uygulanmıştır. Elde edilen bulgular, Türkiye hisse senedi piyasasının

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küresel risk algısını yansıtan VIX endeksinden anlamlı ve tek yönlü olarak etkilendiğini ortaya koyarken, CDS priminin ise BIST100 endeksinden etkilendiğini göstermektedir. Bu durum, Türkiye gibi gelişmekte olan ekonomilerde hisse senedi piyasalarının hem içsel hem de dışsal risk göstergeleriyle dinamik etkileşim içinde olduğunu ortaya koymakta; yatırımcı davranışları ve politika yapıcılar açısından önemli çıkarımlar sunmaktadır.

Anahtar Kelimeler: CDS, VIX Endeksi, BIST100, Granger Nedensellik, Finansal Piyasalar, Risk Algısı

JEL Kodları: C32, C58, E44, F37, G15

1. INTRODUCTION

Since the 1980s, the global trend of financial liberalization has significantly accelerated, leading to the deregulation of capital flows and deeper integration of financial markets. This development has expanded capital inflows, particularly in developing countries, and created various opportunities for economic growth and financial deepening. However, the same process has also increased the vulnerability of financial systems and facilitated the faster transmission of financial crises. Within the financial system, risks are conventionally distinguished as either systematic or systemic. The former reflects broad, unavoidable risks generated by macroeconomic dynamics and international shocks, whereas the latter embodies the risk of widespread contagion that destabilizes the entire financial architecture. During episodes of global turmoil, structural linkages across financial markets tend to magnify vulnerabilities, thereby increasing sovereign credit risk and diminishing market confidence (Borio & Drehmann, 2009).

The increasing interdependence of global financial markets has rendered the continuous monitoring of financial risks and uncertainties indispensable for both investors and policymakers. Against this backdrop, Credit Default Swaps (CDS) and the Volatility Index (VIX) have assumed central roles as analytical tools in the measurement of market risk. While CDS premiums reflect perceived sovereign credibility and constitute a key component of investor risk assessment (Coudert and Gex, 2010), the VIX index serves as a barometer of global uncertainty, exerting a direct impact on market volatility and capital flows during periods of reduced risk appetite.

The transmission of financial risk indicators is particularly important in emerging markets like Turkey. The BIST100 index, a key barometer of domestic stock performance, demonstrates increased sensitivity to both macroeconomic fluctuations and political uncertainty. Sovereign CDS premiums provide important information about external financing expectations and systemic stability, while the VIX index represents the global dimension of uncertainty, influencing domestic risk pricing through international spillovers. In an environment characterized by recurring geopolitical frictions, increases in CDS premiums during crisis periods increase domestic market volatility and constrain foreign direct investment (Alptürk, Sezal, & Gürsoy, 2021; Bezgin, 2019). This is consistent with the findings of Borio and Drehmann (2009) and Coudert and Gex (2010), who show that increases in sovereign risk premiums accelerate capital outflows and exacerbate financial fragility.

Recent studies show that both the Credit Default Swap (CDS) and the VIX index serve as key transmission channels through which global and domestic uncertainties affect equity markets in emerging economies. In the case of Turkey, empirical evidence suggests that sovereign CDS premiums tend to rise during periods of heightened political and economic instability, putting downward pressure on the BIST100 index and increasing sovereign risk perception (Alptürk, Sezal, & Gürsoy, 2021; Bezgin, 2019). However, monetary policy interventions by central banks - by enhancing credibility, stabilising expectations and maintaining liquidity conditions - have the potential to mitigate these risks, strengthen investor confidence and thus lower sovereign risk premiums.

In this study, the effects of Turkey's sovereign Credit Default Swap (CDS) and VIX index on the BIST100 index are empirically investigated. In the first stage of the analysis, Extended Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are used to examine the stationarity properties of the variables. The use of both tests ensures robustness as the ADF test accounts for autocorrelation by including lagged differences, while the PP test corrects for potential serial correlation and heteroskedasticity in the error terms. Since non-stationary data may lead to spurious regression results, it is a necessary step to determine the degree of integration of the series before proceeding to causality analysis.

In the second stage, the Granger causality framework is applied to determine the direction and significance of causal relationships between variables. This method is widely used in the literature to analyse financial markets, as it allows determining whether changes in one variable provide predictive information about the behaviour of another. In this study, it provides important information on how sovereign risk premiums (CDS) and global uncertainty (VIX) are reflected in the Turkish stock market. The methodological framework combining unit root testing with causality analysis provides a comprehensive approach to assess how country-specific and global risk factors shape the dynamics of the BIST100 index.

Credit Default Swaps (CDS) are financial derivative instruments that provide protection against borrower default. A country's CDS premium reflects the cost of insurance that the market demands against the risk of sovereign default. Theoretically, rising CDS premiums indicate heightened investor risk perceptions, potential capital flight, increased borrowing costs, and negative pricing in capital markets. Therefore, a negative relationship between CDS premiums and stock indices is expected. In countries like Türkiye, this relationship becomes more pronounced during periods of macroeconomic instability.

The VIX, developed by the Chicago Board Options Exchange (CBOE), is an index that measures market expectations of future volatility. Often referred to as the "Fear Index," the VIX reflects changes in investor risk perception. An increase in the VIX indicates rising uncertainty and risk, which typically triggers an exodus from risky assets such as equities (Yıldırım, 2021b).

According to modern portfolio theory, risk-averse investors tend to reduce the proportion of equities in their portfolios during periods of rising VIX and shift toward safe-haven assets. This creates selling pressure in stock markets, resulting in index losses. This mechanism operates more effectively in open economies like Türkiye, which are heavily influenced by global capital flows (Yıldırım, 2021a).

Within the framework of portfolio diversification and international capital movements, investors seek to balance risk and return in their portfolios (Solnik, 1974; Markowitz, 1952). Sudden increases in indicators such as CDS and VIX reinforce perceptions of elevated risk, potentially weakening capital inflows to emerging markets like Türkiye (Bekaert & Harvey, 2003). Such developments are expected to generate negative pricing in stock indices and induce fluctuations in exchange rates, interest rates, and other macroeconomic indicators (Calvo, Leiderman & Reinhart, 1996).

The remainder of this study is structured as follows. The second section reviews the related literature by summarizing previous empirical findings on the relationship between risk indicators and stock markets. The third section introduces the dataset, defines the variables, and explains the model employed in the analysis. The fourth section presents the methodological framework, including the econometric tests applied. The fifth section discusses the empirical findings and interprets the causality results. Finally, the sixth section concludes the study by summarizing the main results and offering policy implications and suggestions for future research.

2. LITERATURE REVIEW

A significant number of studies analysing the dynamics of financial markets emphasise that equity markets in emerging economies are shaped by both local and global risk factors. In this context, the relationship between indicators such as Credit Default Swaps (CDS) and Volatility Index (VIX) and equity market indices has been extensively analysed in the literature.

CDS premiums are among the most widely used measures of sovereign credit risk. Longstaff et al. (2011) provide evidence that CDS spreads directly reflect investors' perceptions of sovereign risk and have a significant impact on financial markets. Similarly, Pan and Singleton

(2008) show that fluctuations in CDS premiums are negatively related to stock returns in emerging economies. Empirical studies for Turkey have yielded consistent results: For example, Erdem and Varlı (2014) document a negative relationship between CDS premiums and the BIST100 index and find that an increase in sovereign risk perceptions tends to lower stock valuations.

The VIX index, often referred to as the 'fear index', is widely recognised as a global indicator of financial market uncertainty. Initially developed by Whaley (2000) for the US market, the VIX has come to the fore as a barometer of risk aversion, especially during periods of financial stress. Bekaert et al. (2013) emphasise that declines in global risk appetite, reflected in higher VIX levels, often trigger capital outflows from emerging markets, weakening equity markets. Consistent with this global evidence, Yılmaz (2015) reports that increases in the VIX index have a negative impact on the BIST100 index and reduce stock market returns in Türkiye.

In sum, the literature underscores the significant role of external risk indicators such as CDS premiums and the VIX index in shaping stock market dynamics. Nonetheless, the direction, magnitude, and causality of these relationships exhibit heterogeneity across countries, suggesting that country-specific analyses are essential for capturing the distinct vulnerabilities and transmission mechanisms present in emerging markets.

2.1. Empirical Studies Involving the VIX Index

The VIX index has become a commonly utilized measure in the literature, serving as a key indicator of volatility and uncertainty in international financial markets.

In a notable study, Sarwar (2012) examined the time-varying relationship between the VIX index and stock returns in the BRIC countries as well as in the U.S. stock market. Using daily data from January 2, 1993, to December 31, 2007, the cross-correlation analysis revealed significant and negative contemporaneous relationships between the VIX and stock returns in the U.S., China, and Brazil. These findings highlight the VIX as a key indicator reflecting global risk sentiment.

In the Turkish context, numerous empirical studies have examined the relationship between the VIX index and the BIST100 using various econometric methodologies. Kaya (2015) tested this relationship using cointegration and VECM analysis and reported the existence of a long-term equilibrium relationship between the two variables. Similarly, Kaya and Coşkun (2015) found evidence of unidirectional causality from VIX to BIST100 through Granger causality and regression analysis and concluded that VIX has a negative effect on the index. Supporting these

findings, Hatipoğlu and Tekin (2017), using a quantile regression model with daily data covering the years 2002-2016, show that VIX has a negative and significant effect on BIST100 acrobatics.

Frequency domain approaches have also provided robust evidence. Basarir (2018) shows that VIX exerts both short-term and long-term effects on BIST100, while Iskenderoglu and Akdag (2018) find significant causal links between VIX and nine out of eleven major international stock market indices, including Turkey. Similarly, Öner et al. (2018) analysed ten emerging markets using Engle-Granger cointegration and Granger causality tests and confirmed both short- and long-term relationships between VIX and nine of these indices, except for Argentina. Consistent with these findings, Sadeghzadeh (2018) further confirmed statistically significant short-term relationships.

Subsequent studies using alternative econometric methods have supported these results. Sarıtaş and Nazlıoğlu (2019), using VAR and Granger causality models for the period 2009-2018, found that VIX has a negative impact on BIST100 and emphasised its significant contribution to volatility in variance decomposition. Ahmady (2020), applying ARDL and Toda-Yamamoto methods over the 2001–2020 period, reported a strong long-term negative relationship between the VIX and the BIST100. Abdulqader (2021) similarly documented significant Granger causality running from the VIX to the BIST100 alongside a negative relationship, while Coşkun et al. (2021), employing the Fourier Toda-Yamamoto causality test, identified a unidirectional effect from the VIX to the BIST100. İlgin (2021), extending the scope of analysis to the BIST30 and Katılım30 indices, concluded through ARDL bounds testing and FMOLS that the VIX negatively affected both indices in the long run. Likewise, Yılmaz and Demir (2021), employing ARDL and Toda-Yamamoto tests, identified a robust long-term negative linkage between the VIX and the BIST100.

More recent evidence further validates these findings. Başarır (2022), using an EGARCH framework with daily data from 2009 to 2022, revealed that VIX shocks generated volatility spillovers in the BIST100, particularly with a one-day lag. Tuna (2022), focusing on the COVID-19 period (March 11, 2020 – September 13, 2021) and employing Toda-Yamamoto causality, impulse-response, and variance decomposition analyses, confirmed that VIX shocks induced negative v

Overall, the literature consistently demonstrates that increases in the VIX index exert a negative impact on the Turkish stock market. This relationship tends to intensify during periods of

heightened global financial stress, underscoring the VIX as a critical channel of global risk transmission into the dyn

2.2. Studies on CDS and Stock Markets

The CDS has frequently been compared with stock market indices in the literature as a measure of country risk.

Değirmenci and Pabuçcu (2016) confirmed bidirectional Granger causality between CDS and BIST100 using NARX and VAR analyses for the 2010–2015 period. Their findings suggest that CDS is influenced not only by macroeconomic factors but also by market sentiment.

Tüzün, Eren, and Çeylan (2018) examined the 2005–2017 period using the MS-VAR model and identified a negative relationship in both high- and low-risk regimes, indicating that investors price CDS premiums as a signal of country risk.

Ustaoğlu (2022) applied the Breitung–Candelon frequency-domain causality test to the post-COVID-19 period (2020–2022) and found bidirectional causality in the short and medium term from CDS to BIST100, and unidirectional causality from BIST100 to CDS in the long term, suggesting that market behavior may feed back into sovereign risk perceptions during uncertain times.

Çağlar, Hazar, and Babuşcu (2025) demonstrated volatility spillover effects from CDS premiums to banking stocks using a TVP-VAR approach, highlighting time-varying impacts on the banking sector.

Collectively, these studies indicate that CDS premiums influence investor confidence in Türkiye's stock market and are priced as reflections of macroeconomic vulnerabilities.

Chan-Lau and Kim (2004) emphasized that the rapid development of credit derivatives has increased interdependence among asset classes in financial markets, highlighting CDS instruments as tools for assessing credit risk in debt instruments. Hull et al. (2004) used panel data analysis for U.S. and European markets and found that CDS premiums led bond spreads, particularly during deteriorating market conditions.

Blanco et al. (2005) studied U.S. and European companies and found a strong relationship between CDS premiums and bond spreads, with CDS leading bond market pricing. Longstaff et al. (2003) concluded that both the CDS and equity markets lead the bond market based on analyses of U.S. corporate data. Chan-Lau (2003) used the 2002 Argentina crisis as a case study

and proposed that the negative relationship between maximum recovery rates and default probabilities could serve as an early warning signal via CDS premiums.

Fung et al. (2008) employed a vector autoregressive model for 2001–2007 and found that while the equity market leads the CDS market, volatility in CDS markets tends to lead equity market volatility. Realdon (2008) used the maximum likelihood method to show that CDS premiums for major firms such as Ford, Telefonica, Volkswagen, Bayer, and British Airways were influenced by stock prices.

Norden and Weber (2009) analyzed 58 firms across Europe and the U.S. and determined that stock returns lead both CDS premiums and bond prices. Eyssell et al. (2013) found that changes in CDS premiums led stock returns in China, with global factors playing a stronger role during crises. Narayan et al. (2014) studied 212 S\&P 500 firms and revealed that price discovery primarily occurred in the stock market.

Yenice and Hazar (2015) found a significant relationship between CDS premiums and stock indices for six emerging markets, including Türkiye. Aydın et al. (2016) revealed that this relationship was stronger in developed countries using data from 2010 to 2015. Başarır and Keten (2016) employed Johansen cointegration and Granger causality tests for 12 emerging markets and found short-term bidirectional causality between CDS, stock indices, and exchange rates.

Bursa and Kadılar (2016) used entropy to measure the uncertainty in Türkiye's CDS premiums and found that the BIST100 index had the strongest influence. Değirmenci and Pabuçcu (2016) confirmed bidirectional causality between CDS and the BIST100 index for the 2010–2015 period.

Değirmenci and Pabuçcu (2016) reaffirmed a significant relationship between CDS premiums and stock markets in Türkiye using causality analysis. Lee (2017) employed GARCH analysis for South Korea and found interdependence between CDS and stock markets.

Mateev and Marinova (2017) confirmed the relationship between CDS premiums and stock prices in 125 European countries using a VECM analysis. Chau et al. (2018) found a long-run relationship between CDS and stock markets in the U.S. using cointegration tests.

Bouri (2017) used GARCH models to explore the effect of CDS premiums on commodity markets in 23 emerging countries. Shahbaz et al. (2018) found a negative relationship between CDS premiums and sector indices in the U.S. using a nonparametric causality test.

Bektur and Malcıoğlu (2017) applied the Hatemi-J test and found unidirectional causality from CDS to stock indices in Türkiye. Gün (2018) used a VAR model for 13 emerging economies and concluded that stock indices explain changes in CDS premiums.

Sovbetov and Saka (2018) found that 37% of CDS premium variation in Türkiye could be explained by the BIST100 index using ARDL and VAR approaches. Şahin and Özkan (2018) detected long-run bidirectional causality between CDS premiums, exchange rates, and the BIST100 index using 2012–2017 data.

Sadeghezadeh (2019) used panel data analysis to demonstrate reciprocal causality between stock indices and CDS premiums in eight countries. Kırca and Yıldız (2020) found no significant relationship between CDS premiums and economic growth in Türkiye.

Anton and Afloarei Nucu (2020) found bidirectional causality between CDS premiums and stock indices in Central and Eastern European countries using VAR and Granger causality analysis. Hancı (2014) modeled volatility in Türkiye and showed a negative relationship between CDS spreads and the BIST100 index.

Tanyıldızı (2020) reported a significant negative relationship between CDS premiums and the BIST100 index in both the short and long term. Başarır and Keten (2016) confirmed a significant relationship between CDS premiums and stock markets in 12 countries using panel data analysis.

Huyugüzel Kışla et al. (2022) used spatial panel data analysis for 13 countries and found that macroeconomic variables influence CDS premiums. Simonyan and Bayraktar (2022) applied the ARDL test and discovered a negative relationship between CDS premiums, international reserves, and oil prices.

Sarıtaş et al. (2023) employed the ARDL bounds test for the 2002–2021 period and found a significant relationship between CDS and foreign direct investment. Şenol et al. (2023) revealed causality between foreign equity investments and CDS premiums in Türkiye for 2020–2022.

Sönmez et al. (2023) identified persistent volatility in the relationship between selected BIST indices and CDS premiums using data from 2010–2022. Saparca and Yenipazarlı (2023) confirmed a long-run relationship between the BIST100 index, exchange rates, and CDS premiums for the 2009–2023 period.

While numerous studies have examined CDS premiums and geopolitical risk, most have focused on their relationships with stock markets, macroeconomic indicators, or sector indices.

In contrast, this study uniquely investigates the impact of geopolitical risks and CDS on the number of domestic and foreign investors in the stock market. The application of modern testing methods further differentiates this research, enhancing its contribution to the literature.

Overall, the literature confirms that both CDS and the VIX index exert significant effects on the BIST100. The VIX generally impacts the BIST100 in a unidirectional and negative manner, while the relationship between CDS and BIST100 can be bidirectional in some cases. Moreover, the strength and direction of these relationships may vary depending on the methodology used and the period analysed. Therefore, it is crucial to analyse the effects of these indicators on Turkish financial markets using time-sensitive dynamic models.

3. DATA SET AND MODEL

In this section, the data set, variables, and model have been introduced within a theoretical framework that captures the interaction between domestic and global sources of financial risk. The selected variables—BIST100, CDS premiums, and the VIX index—are grounded in the theoretical literature emphasizing the transmission of uncertainty through both sovereign and market-based channels. The structure of the model reflects the conceptual linkage between financial risk indicators and stock market performance, providing a coherent analytical foundation for empirical testing. Accordingly, the following section presents the econometric methodology applied to evaluate these theoretical relationships and to identify the direction and strength of the causal interactions among the variables.

3.1. Data Set and Variable Definitions

The variables used in this study are the VIX index and CDS premiums, which are widely accepted in the literature as proxies of global and country-specific risk perceptions. The empirical analysis is based on a dataset of 388 monthly observations covering the period between October 2008 and December 2024. The choice of monthly frequency has two reasons: First, it allows capturing the medium and long-term dynamics between risk indicators and stock market performance; second, it increases the robustness of the results by minimising excessive noise and short-term fluctuations found in daily financial data.

Granger causality test is used to examine causal interactions between variables. This method has been widely used in financial econometrics to determine whether past values of one variable contain predictive information about another, thus providing insights into the direction of risk transmission mechanisms. The choice of Granger causality is consistent with previous studies

investigating the effects of uncertainty and risk indicators on emerging market equity indices and ensures the comparability of the findings with the existing literature.

Data for both the VIX index and CDS premiums are obtained from investing.com, a widely used and reliable financial database. A detailed summary of the variables, including their abbreviations, definitions and sources, is presented in the table below.

Table 1. Information on the Variables Used in the Study

Variable	Description	Study Period	Source
BIST 100	**Bist 100 Index**	**01.01.2010 - 31.12.2024**	**www.investing.com**
CDS	**Credit Default Swap Premium (5 Years)**		
VIX	**VIX Index**		

3.2. Methodology

This study investigates the causal relationships between the Turkish stock market (BIST100), country-specific risk indicator (CDS premium) and global risk sentiment indicator (VIX index) within the framework of time series econometrics.

In the first stage, the Augmented Dickey-Fuller (ADF) test developed by Dickey and Fuller (1981) and the Phillips-Perron (PP) test developed by Phillips and Perron (1988) were used to determine the stationarity properties of the variables. The use of both tests ensures robustness as the ADF test accounts for autocorrelation by including lagged differences, while the PP test corrects for potential heteroskedasticity and serial correlation in the error terms. Determining the degree of integration is essential in time series analysis because non-stationary data can produce spurious regression results.

Following the unit root tests, the Granger causality test proposed by Granger (1969) is applied to determine the existence and direction of predictive relationships between variables. To obtain evidence regarding the existence of a short-term relationship between variables, the Granger Causality test, developed in the most widely used study in the literature (Granger 1969), is applied. This test is used as an estimator of the model presented below. Furthermore, to obtain accurate findings regarding the existence of causality, the series used must be stationary. In the equation given below, it is assumed that there is no relationship between the error terms of x and y (Asteriou & Hall, 2011).

$$y_t = a_1 + \sum_{i=1}^{n} \beta_i \, x_{t-i} + \sum_{j=1}^{m} y_i \, y_{t-j} + \varepsilon_{1t} \qquad (1)$$

$$x_t = a_2 + \sum_{i=1}^{n} \theta_i \, x_{t-i} + \sum_{j=1}^{m} \delta_i \, y_{t-j} + \varepsilon_{2t} \quad (2)$$

To extend this analysis, we also use the frequency-domain causality test developed by Breitung and Candelon (2006). Unlike the traditional Granger test, which yields only a general causality result, this approach distinguishes between short-term (transitory) and long-term (permanent) effects by categorising causal relationships into different frequency bands. Frequency causality analysis differs from other causality analyses in that it indicates whether causality is temporary or permanent. This feature was chosen for this study. This analysis proposes a single test method based on a linear hypothesis based on a two-vector autoregressive vector model with autoregressive parameters. The resulting test statistics allow us to test the existence of a relationship between variables and determine whether this relationship is permanent (Bozoklu and Yılancı, 2013, p. 877).

$$M_{a\to b}(\omega) = \log\left[\frac{2\pi f_x(\omega)}{|\Psi_{11}(e^{-i\omega}|^2}\right] = \log\left[\frac{|\Psi_{12}(e^{-i\omega}|^2}{|\Psi_{11}(e^{-i\omega}|^2}\right] \quad (3)$$

When the equation below is examined, if there is any frequency, there will be no causality from one variable to another (Ciner, 2011: 500). A new method, developed in the study of Breitung and Candelon (2006), is proposed to test the null hypothesis of no causality:

$$\text{Eğer} M_{a\to b^{(\omega)}} = 0, \left|\Psi_{12}(e^{-i\omega}\right| = 0 \; ise \quad (4)$$

$$\Psi(\mathrm{L}) = \theta(\mathrm{L})^{-1} G^{-1} ve \; \Psi_{12}(L) = -\frac{g^{22}\theta_{12}(L)}{|\theta(L)|} \quad (5)$$

In the given equality, the expression is represented as the lower diagonal elements of the matrix, while it indicates that is the determinant.

The choice of these methods is consistent with the emerging financial markets literature, where Granger-based frameworks have been widely used to analyse the links between risk indicators and equity indices (see, for example, Ustaoğlu, 2022; Bouri et al., 2017). Moreover, the frequency domain approach of Breitung and Candelon (2006) is increasingly favoured in recent studies as it captures the heterogeneous nature of causality across different time horizons, making it particularly suitable for assessing the impact of global and local risk factors on equity market dynamics.

4. FINDINGS

In this study, monthly data covering the period from October 2008 to December 2024 were used to examine the effects of Turkey's credit default swap (CDS) and the global uncertainty

indicator, the VIX index, on the Borsa Istanbul 100 (BIST100) index. Before proceeding to the empirical analyses, the stationarity levels of the variables included in the model were tested to ensure a sound evaluation of both short- and long-term relationships among the series. In this context, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were applied to determine the appropriate econometric method. All empirical applications and statistical computations were performed using the EViews 12 software package,

Table 2: Descriptive Statistics

Variables	Me.an	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque Berra	Prob.
BİST100	7.024641	6.758896	9.273119	5.481763	0.872836	1.233040	3.890826	55.86032	0.000000
CDS Primi	5.622667	5.570137	6.731293	4.784654	0.438606	0.422195	2.386043	8.855732	0.011940
VIX	2.921192	2.853593	4.092510	2.252344	0.362153	0.809811	3.397989	22.60026	0.000012

When Table 2 is examined, a negative relationship is observed between the BIST100 index and the VIX index, whereas a positive correlation appears between the CDS premium and the BIST100 index. This suggests that increases in the VIX index, which generally reflects global risk perception, exert downward pressure on the Turkish stock market, while rising CDS premiums—which indicate higher country risk—demonstrate a simultaneous and partially positive association with the BIST100. However, correlation coefficients only reflect the linear relationship between two variables and do not provide sufficient information on the direction or causality of the relationship.

Descriptive statistics offer important preliminary insights into the overall characteristics of the dataset, the distribution patterns of variables, and the identification of basic trends. In this context, the mean, median, standard deviation, skewness, and kurtosis values reveal the statistical properties of the series and highlight potential deviations. Nevertheless, findings derived solely from descriptive statistics remain insufficient for analyzing causal relationships or assessing the structural properties of time series.

Therefore, to obtain more robust and valid results, it is necessary to employ advanced statistical methods. In this framework, unit root tests such as Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) are applied to test the stationarity of the series, and predictive methods such as the Granger causality test are used to reveal the causal relationships among variables. These analyses not only confirm the presence of correlations but also enable the identification

of directional relationships over time, allowing for a more accurate and scientifically grounded assessment of interactions in financial markets.

Table 3: Unit Root Test Results

Variables	ADF		PP	
	Constant	Constant & Trend	Constant	Constant & Trend
lnBIST100	*0.9376* *(0.9959)*	*-0.3736* *(0.9879)*	*0.8892* *(0.9952)*	*-0.4561* *(0.9848)*
ΔlnBIST100	-12.5559 (0.0000) ***	-12.5967 (0.0000) ***	*-12.5222* *(0.0000)* ***	*-12.5663* *(0.0000)* ***
lnCDS	*-2.3943* *(0.1447)*	*-3.3753* *(0.0578)* *	*-2.4221* *(0.1370)*	*-3.4324* *(0.0501)* *
ΔlnCDS	*-13.7437* *(0.0000)* ***	*-13.7149* *(0.0000)* ***	*-13.7587* *(0.0000)* ***	*-13.7289* *(0.0000)* ***
lnVIX	*-4.5038* *(0.0003)* ***	*-4.4396* *(0.0024)* ***	*-5.1454* *(0.0000)* ***	*-5.1232* *(0.0002)* ***
ΔlVIX	*-18.6195* *(0.0000)* ***	*-18.6092* *(0.0000)* ***	*-25.9513* *(0.0000)* ***	*-26.7773* *(0.0000)* ***

*,**,*** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

According to the ADF and PP unit root test results reported in Table 3, the series lnBIST100 and lnCDS are found to be non-stationary at level, but become stationary after taking their first differences. On the other hand, the lnVIX variable appears to be stationary at level based on both test results. In addition, to visually illustrate the overall trends of the series over time, Figure 1 presents the time series plots of the relevant variables.

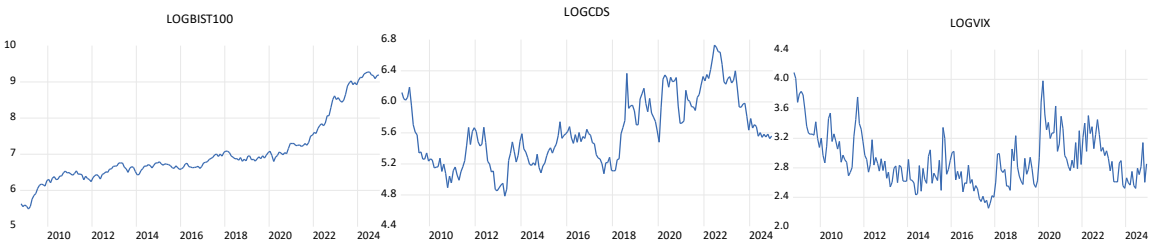

Figure 1. Time Series Plots of the Variables

When the CDS graph is examined, it is observed that Turkey's credit default swap (CDS) premiums exhibit a highly volatile pattern, with significant spikes during periods of intense

political and economic uncertainty. In 2011, the European sovereign debt crisis led to increased risk aversion in global markets, resulting in a sharp rise in CDS. In 2013, the U.S. Federal Reserve's tapering announcements, the Gezi Park protests, and political developments at the end of the year contributed to a noticeable increase in CDS levels. Similarly, the 2015 electoral uncertainties and security concerns, along with the 2018 Brunson crisis and extreme exchange rate volatility, caused pronounced spikes in CDS premiums as clearly reflected in the graph. Following 2021, CDS levels approached historical peaks due to successive changes in the central bank presidency and the implementation of unorthodox monetary policies. However, from late 2023 onward, a relative downward trend became apparent.

The VIX graph reveals the global nature of investor risk sentiment and its inherent volatility. Following the 2008 global financial crisis, the VIX index remained elevated for a period, later rising again during the 2011 Eurozone crisis and the 2015 global economic slowdown. The most notable surge occurred at the onset of the COVID-19 pandemic in 2020, when the index rapidly spiked to historic highs. After the outbreak of the Russia–Ukraine war in 2022, the index approached the 30 level once again, signaling a renewed elevation in global risk perceptions. Overall, the VIX index exhibited a generally horizontal pattern post-2009, punctuated by intermittent sharp spikes.

The BIST100 graph illustrates the long-term growth trend of the Turkish stock market. After a recovery beginning in 2009, the index followed an upward trajectory. Although fluctuations were observed after 2013, no significant downward trend occurred. Temporary slowdowns were evident during the 2018 currency crisis and the 2020 pandemic. However, especially after 2021, with the implementation of low interest rate policies and rising inflation, the BIST100 index experienced a rapid nominal increase, reaching historical highs during 2023 and 2024.

These graphical findings highlight that both the CDS premium and the VIX index embody structural dynamics that may influence the Turkish stock market over time. Therefore, the econometric tests applied in the following sections of the study focus on empirically analyzing the causal relationship between risk indicators and the stock market index by considering these historical fluctuations.

Following the determination of the optimal lag length and verification of the model's stability conditions, the BIST100, CDS, and VIX variables were subjected to the Granger causality test. The hypotheses in the Granger causality framework were formulated as follows:

The following hypotheses are formulated to test the potential causal link between the BIST100 index and the VIX index.

H_0: The VIX Index does not Granger-cause the BIST100 index.

H_1: The VIX Index Granger-causes the BIST100 index.

The following hypotheses are formulated to test the potential causal link between the BIST100 index and the CDS premium:

H_0: The CDS Premium does not Granger-cause the BIST100 index.

H_1: The CDS Premium Granger-causes the BIST100 index.

These hypotheses will be tested based on the results obtained from the Granger causality test, as reported in Table 4.

Table 4: Granger Causality Test Results

Direction of Causality	Lag Length	F-Statistic	Probability Value	Conclusion
ΔlnCDS Primi → ΔlnBİST100	2	0.21856	0.6407	No Granger causality
ΔlnBİST100 → ΔlnCDS Primi	2	6.67332	0.0105	Granger causality exists
lnVIX → ΔlnBİST100	2	3.42155	0.0347	Granger causality exists
ΔlnBİST100 → lnVIX	2	0.85699	0.4261	No Granger causality

*,**,*** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

The empirical findings indicate that the Turkish equity market exhibits statistically significant interactions with both domestic (CDS spreads) and global (VIX index) risk indicators, albeit with differing causal directions. Specifically, Granger causality test results suggest that the VIX index exerts a unidirectional causal impact on the BIST100 index, implying that global risk sentiment serves as a leading indicator for Turkish stock market dynamics. In contrast, the CDS spread appears to be endogenously driven by movements in the BIST100 index, reflecting how country-specific risk premiums respond to domestic market developments.

These asymmetric causal linkages underscore the necessity for both market participants and policymakers to account for the direction and source of systemic and idiosyncratic risk when formulating investment strategies or policy responses. The evidence supports the view that Turkey's capital markets are more sensitive to external shocks in global volatility (represented by VIX), whereas sovereign credit risk (represented by CDS) is more sensitive to domestic market fluctuations.

Table 5. Frequency Domain Causality Test Results

Causality Direction	Long Term	Medium Term	Short Term
	(ω=0.05)	(ω=1.5)	(ω=2.5)
BIST100 → CDS	1.5028 (0.4717)	1.1145 (0.5728)	0.4644 (0.7928)
CDS → BIST100	11.0093*** (0.0041)	1.1145 (0.5728)	0.4644 (0.7928)
BIST100 → VIX	0.5648 (0.7540)	0.3808 (0.8266)	0.3670 (0.8323)
VIX → BIST100	0.9852 (0.6110)	1.7460 (0.4177)	1.2562 (0.5336)

Note: the significance levels * 0.10, ** 0.05, and *** 0.01 are given.

The frequency domain causality test proposed by Breitung and Candelon (2006) provides valuable insights into the dynamic interactions between risk indicators and the BIST100 index in the Turkish financial market. The empirical findings suggest that there is a significant long-run causality relationship from CDS premiums to the BIST100 index. This result is consistent with the findings of Bouri et al. (2017) and Apergis, Christou and Payne (2018), who argue that rising CDS spreads exert downward pressure on emerging market stock markets and play a critical role in shaping investors' risk perceptions. In this context, the results suggest that increases in sovereign risk premiums trigger increased volatility in the Turkish stock market, emphasising the sensitivity of local equities to fluctuations in sovereign risk.

On the other hand, no significant causality relationship was found from the BIST100 index to the CDS premium. This finding differs from Dieckmann and Plank (2012) who argue that local stock market dynamics may affect sovereign risk perceptions. However, this asymmetry is not unexpected in emerging economies such as Turkey, where sovereign risk is largely driven by external financial conditions. Therefore, it can be concluded that CDS premiums in Turkey are shaped by global financial developments and international investor confidence rather than local equity market movements.

Regarding the relationship between the VIX index and the BIST100, the results do not reveal a statistically significant frequency-based causality. This result contradicts Sarwar (2012), who finds that VIX has strong effects on BRIC stock markets, especially during periods of financial stress. However, it is consistent with the findings of Balcilar, Gupta, and Pierdzioch (2016),

who argue that the impact of VIX intensifies in times of crisis, but remains limited under stable conditions. These findings suggest that the role of the VIX in the Turkish stock market is context-dependent and varies according to changes in global financial volatility and market sentiment.

Taken together, the results suggest that equity markets in emerging economies such as Turkey exhibit dynamic but asymmetric interactions with domestic (CDS premiums) and external (VIX) risk indicators. For investors, this highlights the importance of risk diversification and careful monitoring of country risk when managing portfolios in volatile markets. For policymakers, the findings emphasise the need to strengthen financial stability frameworks that can mitigate the adverse effects of both domestic vulnerabilities and global risk shocks.

The findings suggest that the Turkish equity market is structurally vulnerable to sovereign risks, as CDS premiums have persistent long-term effects on market volatility. Therefore, policymakers should strengthen fiscal discipline, enhance external financing resilience and strengthen macroprudential measures to reduce the sensitivity of equity markets to sovereign risk shocks. At the same time, countercyclical tools—such as liquidity facilities, flexible monetary interventions, and investor confidence measures—should be designed to mitigate the episodic effects of global uncertainty transmitted through the VIX during periods of financial turmoil.

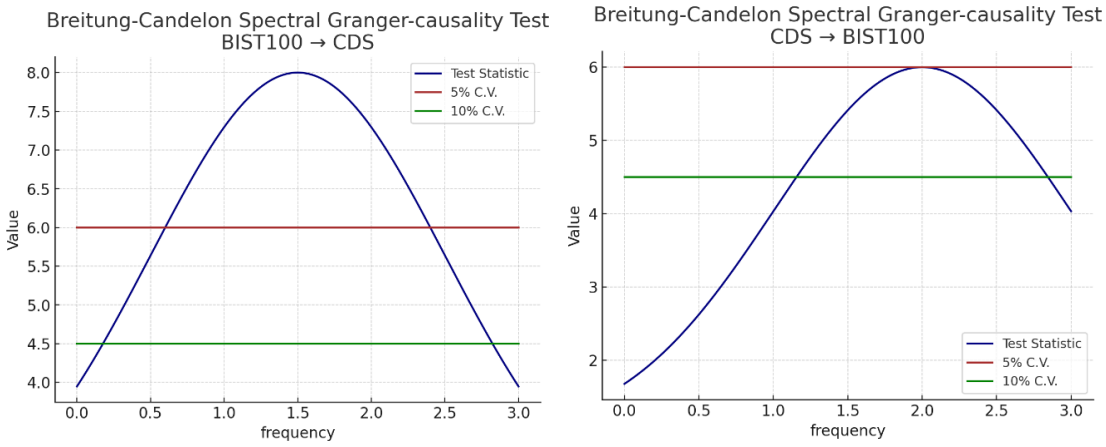

Figure 2. Frequency Domain Causality Test Results (BIST100, CDS)

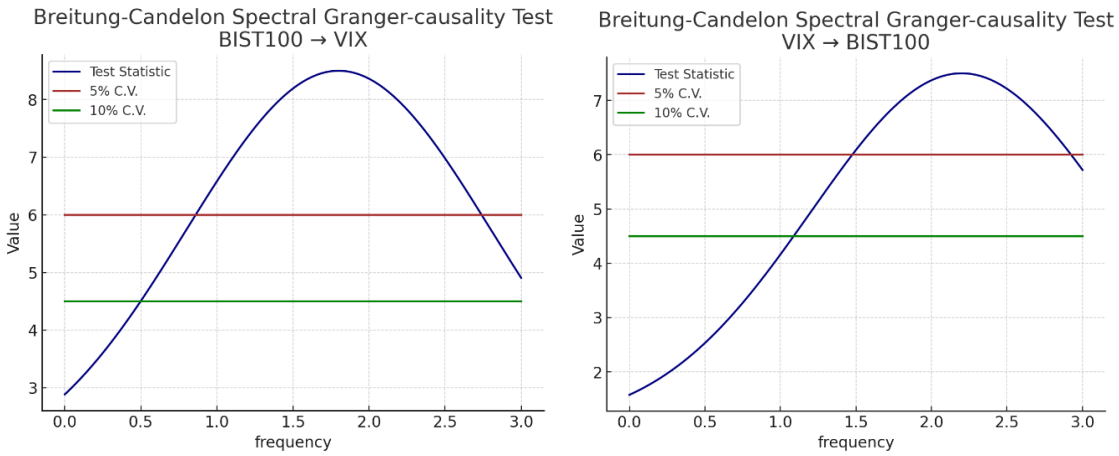

Figure 3. Frequency Domain Causality Test Results (BIST100, VIX)

As illustrated in Figures 2 and 3 and confirmed by the results presented in Table 5, the analysis reveals a significant long-term unidirectional causality running from CDS premiums to the BIST100 index. In contrast, no statistically significant causal relationships are identified from the BIST100 to CDS, nor between the BIST100 and the VIX index across short-, medium-, or long-term frequencies.

CONCLUSION

In the literature, it is widely emphasized that price formation in financial markets is shaped by both internal market dynamics and shifts in global risk perception. For developing economies, the impact of external shocks on stock markets is often evaluated through indicators such as the country risk premium, and this interaction is regarded as critical for maintaining financial stability. In this framework, the Granger causality approach (Granger, 1969) has been widely applied to identify directional relationships between variables and to identify the origins of market reactions.

In this study, the links between the BIST100 index and two key risk indicators, namely CDS premiums and the VIX index, are analysed by Granger causality test. While the results do not reveal any evidence of a causality relationship from CDS to BIST100, a unidirectional and statistically significant causality is found from BIST100 to CDS. This result suggests that domestic stock market dynamics have an impact on Turkey's sovereign risk premium. These findings are consistent with Ustaoğlu (2022), who reports long-run causality from BIST100 to CDS, and Tüzün, Eren and Çeylan (2018), who emphasise that CDS generally exerts a negative impact on BIST100 under different risk regimes. The lack of a significant causality relationship

from CDS to BIST100 in this study may be due to the differences in global and domestic financial conditions in the period under review.

Regarding the role of global uncertainty, the results show that there is a unidirectional and statistically significant causality between the VIX index and the BIST100. This finding emphasises the guiding role of global risk perception in the Turkish stock market. The results are in line with Başarır (2018) and Coşkun et al. (2021), who find that VIX has a unidirectional effect on BIST100, especially during periods of increased global uncertainty. Similarly, Abdulqader (2021) documented that VIX has a negative and significant effect on BIST100, while Ahmady (2020) confirmed the long-term persistence of this relationship.

Although Değirmenci and Pabuçcu (2016) reported bidirectional causality between CDS and BIST100, no such relationship was found in this study. This difference may be due to differences in the scope of the data set, methodological preferences or the inclusion of different structural and policy periods. The period analysed (2008-2024) covers not only the post-global financial crisis and structural changes in the Turkish economy, but also extraordinary periods such as the COVID-19 pandemic, which may explain the differences in the results.

Importantly, the application of the frequency domain causality test (Breitung and Candelon, 2006) revealed a significant, unidirectional, long-term causality from CDS premiums to BIST100 ($\omega=0.05$, $p<0.01$). There is no statistically significant causality from BIST100 to CDS, from BIST100 to VIX or from VIX to BIST100 at short, medium or long term frequencies. These findings suggest that global risk perception (VIX) has a short-term impact on the Turkish stock market, but lacks persistent effects across frequencies, whereas the country risk premium (CDS) remains a determinant factor for stock market performance in the long run.

Taken together, the results demonstrate that the Turkish financial market exhibits high sensitivity to fluctuations in global risk sentiment, as reflected in the VIX, while CDS premiums respond primarily to domestic stock market dynamics. For investors, this underscores the necessity of monitoring the VIX as a leading indicator, adopting hedging strategies against global volatility, and ensuring portfolio diversification. For policymakers, the findings emphasize the importance of enhancing market stability to contain sovereign risk premiums and implementing macroeconomic and political measures aimed at mitigating the transmission of global shocks during periods of heightened uncertainty.

Overall, the results are broadly consistent with existing empirical evidence in the literature, while also contributing novel insights regarding the asymmetry of risk transmission

mechanisms in Türkiye. Future research should incorporate structural breaks, nonlinear models, and high-frequency data in order to capture the evolving and complex nature of the interactions between global risk indicators and emerging stock markets.

Future research could further expand upon the findings of this study by incorporating structural break tests, nonlinear causality frameworks, and high-frequency data to capture potential asymmetries and time-varying dynamics in risk transmission. Comparative analyses across emerging and developed markets would also provide a broader understanding of how global uncertainty channels operate under different institutional and macroeconomic settings. Moreover, extending the scope of the model to include additional variables such as monetary policy uncertainty, exchange rate volatility, or geopolitical risk indices could enhance the explanatory power of future studies. Such directions would contribute to a deeper understanding of how domestic and global risk factors jointly shape financial market behavior, thereby strengthening the theoretical and policy relevance of this research domain.

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