Chapter 12

The Impact of Global Volatility Indices on Sovereign Credit Risk: A Case Study of Türkiye's Cds Premiums

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Abstract

This study examines the influence of global market volatility, measured by the CBOE Volatility Indices (VIX and VXO), on Türkiye's five-year Credit Default Swap (CDS) premiums. The analysis, covering VIX data from February 28, 2008, to November 27, 2024, and VXO data from February 28, 2008, to August 30, 2021, utilizes advanced econometric techniques, including multivariate GARCH models and the causality in variance test. The results reveal a significant and time-varying correlation between Türkiye's CDS premiums and global volatility indices, particularly during times of heightened market uncertainty, such as the 2008 Global Financial Crisis and the 2020 COVID-19 pandemic. The study highlights the critical role of global financial conditions in shaping fluctuations in Türkiye's CDS premiums, emphasizing the interconnectedness between sovereign credit risk and global volatility during crises. The use of second-moment causality analysis provides deeper insights into how volatility shocks transmit, revealing asymmetric effects on CDS premiums. Overall, the research underscores the growing importance of global financial volatility as a determinant of sovereign credit risk for emerging markets like Türkiye, with implications for both policymakers and investors in managing risk during periods of instability.

1. INTRODUCTION

The global financial crisis, which began with the bankruptcy of Lehman Brothers on September 15, 2008, marked the start of the most severe economic downturn since the Great Depression of the 1930s. This crisis led to the collapse of key financial institutions and a significant contraction in

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global markets (Wang and Yao, 2014). In the aftermath, another wave of financial instability emerged, largely driven by sovereign debt crises in several European countries, including Portugal, Ireland, Greece, and Spain (Wang and Yao, 2014). Unlike domestic debts, sovereign debts are typically denominated in US dollars and traded on international financial markets, which exposes them to greater global economic and political risks. The risks associated with sovereign debt, particularly in emerging economies, are influenced by both economic and political factors. Economic risk reflects the financial health of the issuing country, including its fiscal conditions and external debt levels, while political risk pertains to the stability of its political regime (Wang et al., 2013). As sovereign default probabilities increase, these risks are often mirrored in widening sovereign debt spreads and rising Credit default swap (CDS) prices, key indicators of investor perceptions of sovereign risk.

The financial turmoil resulting from this crisis highlighted the growing importance of instruments like CDS in managing credit risk within global markets (Ho, 2016:580). As the crisis unfolded, the role of CDSs expanded significantly, offering a means for investors to hedge against credit events. A CDS contract provides the buyer with protection against losses due to predefined credit events related to a reference entity (Ertugrul and Ozturk, 2013). These events include defaults, failures to pay, or debt restructurings, triggering compensation for the protection buyer. The widespread financial upheaval emphasized the necessity for these instruments, as investors sought solutions to manage default risks more effectively. In response, CDSs became indispensable in the financial environment, serving as vital tools to mitigate credit risk and protect investors from potential losses.

Sovereign Credit Default Swaps (SCDS) are a specific subtype of CDSs that offer protection against losses tied to sovereign debt credit events. These contracts generally consist of two key components: the premium leg, where the buyer pays for protection, and the contingent leg, which obligates the protection seller to make a payment if a predefined credit event occurs. Settlement is usually done through the physical delivery of eligible bonds in exchange for the original face value (Fender et al., 2012). Sovereign CDS contracts include five main features: (1) the reference entity (the issuer of the debt), (2) reference obligations, (3) the contract term (with 5-year contracts being the most liquid), (4) a notional principal, and (5) specific credit events that trigger payments, such as bankruptcy, failure to pay, debt restructuring, or rare events like obligation default, obligation acceleration, and repudiation or moratorium (Markit Credit Indices Primer, 2014[2]).

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2 https://content.markitcdn.com/www.markit.com/Company/Files/DownloadFiles?CMSID=577e364482314b31b158ae2c2cecc89d

SCDS pricing is primarily determined by macroeconomic fundamentals such as inflation, fiscal stability, and debt levels, which directly influence the perceived risk of a country's ability to meet its debt obligations. Theoretical frameworks suggest that greater economic volatility increases this risk, leading to wider CDS spreads as investors demand higher premiums for the added uncertainty. This heightened risk, driven by factors such as inflation, fiscal stability, and terms of trade volatility, is reflected in wider CDS spreads, as investors demand higher premiums for the additional uncertainty and potential for default (Hilscher and Nosbusch, 2010). Empirical studies consistently highlight the importance of these domestic economic factors in shaping sovereign risk premiums (Mellios and Paget-Blanc, 2006; Georgievska et al., 2008; Aizenman et al., 2010; Hilscher and Nosbusch, 2010; Ho, 2016). However, in addition to macroeconomic conditions, global financial factors, particularly since the 2008 financial crisis, have become increasingly significant (Bellas et al., 2010; Csonto and Ivaschenko, 2013; Eyssell et al., 2013; Doshi et al., 2017; Jang, 2017; Erer, 2022; Çevik and Şahin Çevik, 2023). Theories of global financial contagion and financial stress point to the role of global risk indicators, such as the VIX, in driving CDS spreads. These global factors are shown to affect sovereign CDS pricing both in the short and long term, emphasizing the interplay between domestic economic conditions and global financial market dynamics.

Some studies, particularly following the 2008 financial crisis, have found that global markets have become even more influential in shaping sovereign CDS spreads (Pan and Singleton, 2008; Wang et al., 2010; Longstaff et al., 2011; Fender et al., 2012; Wang and Yao, 2014. The global interconnectedness of financial markets and the rise of systemic risks have made international factors increasingly decisive in determining sovereign risk, sometimes even overshadowing domestic economic conditions. In the wake of the crisis, global financial conditions (shaped by risk appetite, financial stress, and investor sentiment) have played a crucial role in driving risk premiums, highlighting the growing significance of the global financial environment in the post-crisis era. This shift underscores the importance of considering both domestic and global factors in understanding the pricing dynamics of sovereign credit risk.

In this broader context, specific global financial indicators such as global market volatility and shifts in risk appetite have become key determinants of sovereign CDS spreads in emerging markets. These factors not only affect borrowing costs but also influence investor perceptions of risk, thereby shaping international lending conditions and sovereign credit risk. The underlying assumption in many studies is that international lenders are risk-neutral, and that changes in the U.S. real interest rate affect sovereign interest rates in international markets through arbitrage mechanisms, along with a higher risk premium for default risk. However, international lenders are risk-averse and require additional premiums to compensate for shifts in their risk appetite, which are influenced by both interest rate movements and market volatility (Akıncı, 2013). Consequently, fluctuations in global financial conditions, such as changes in stock market volatility or interest rate movements, can have significant impacts on CDS spreads, reflecting the evolving financial environment.

The purpose of this study, within the framework of the latest literature, is to examine the effects of the CBOE S&P 500 Volatility Index (VIX) and CBOE S&P 100 Volatility Index (VXO) indices, which are commonly used to measure market volatility, on Türkiye's 5-year sovereign CDS premium. The VIX and the VXO are key measures of market expectations regarding future volatility. The VIX is based on the implied volatility of S&P 500 index options and is often referred to as the "fear gauge" of the financial markets, as it reflects investor sentiment and uncertainty. On the other hand, the VXO measures implied volatility from options on the S&P 100 index, focusing specifically on the largest, most liquid companies. Both indices provide insights into investor expectations of market risk, but the VIX is more widely used and is considered a broader gauge of market volatility.

The contribution of this study to existing literature is twofold: both in a broad sense and a more specific context. First, while there is a limited amount of research focusing on Türkiye, this study provides insights into the impact of global volatility indices (VIX and VXO) on Türkiye's CDS premium. Second, unlike most studies that focus on the relationships between first moments (mean values), our study investigates the second moments (volatility) of the series, offering a more nuanced understanding of the relationships between these variables. In this context, we not only employ multivariate GARCH models to explore volatility spillovers but also investigate whether there is an asymmetric effect in the correlations between the series. Finally, we conduct causality in variance tests to explore whether the relationship between the series is unidirectional or bidirectional in terms of volatility transmission.

2. LITERATURE REVIEW

Over the past two decades, an increasing body of literature has delved into the determinants of CDS spreads, with some studies concentrating on country-specific conditions, while others emphasize the interplay between global and domestic factors influencing CDS spreads. In the aftermath of the global financial crisis, a subset of research has predominantly directed its attention toward the influence of global markets on CDS spreads, underscoring the interconnectedness of financial systems across borders. Among the studies focusing on country-specific conditions, Mellios and Paget-Blanc (2006), Georgievska et al. (2008), Aizenman et al. (2010), and Ho (2016) emphasize the importance of economic fundamentals in explaining sovereign risk premiums. Specifically, Aizenman et al. (2013) investigate emerging markets from 2004 to 2012, including the global financial crisis period, and find that inflation, state fragility, and debt ratios are crucial determinants of CDS spreads, with higher inflation and external debt leading to wider spreads. Similarly, Augustin and Tédongap (2016) show that expected U.S. growth and consumption volatility are key factors driving CDS spreads, while financial variables such as the VIX and volatility risk premium fall short in explaining both the level and slope components of spreads. Building on this, Chernov et al. (2020) extend this perspective by demonstrating that U.S. sovereign CDS premiums have remained elevated since the crisis, primarily due to concerns over the probability of fiscal default. Their macrofinance model, which incorporates fiscal and monetary policies, underscores the crucial role of macroeconomic factors including such as inflation, growth, and debt in determining the risk of fiscal default and shaping CDS premiums. These findings emphasize the central role of macroeconomic variables in the pricing of sovereign risk, particularly regarding fiscal default risk. In a similar vein, Güngör and Erer (2020) explore the volatility spillover between CDS premiums and the BIST 100 index in Türkiye from January 4, 2010, to December 31, 2019, using the variance causality test of Hafner and Herwartz (2006) and the DCC-FIAPARCH model, revealing bidirectional causality.

While some studies primarily emphasize country-specific factors, others examine the combined influence of domestic and global determinants on sovereign CDS spreads. Bellas et al. (2010) argue that the impact of macroeconomic conditions and global financial market factors on sovereign bond spreads varies across time horizons. Specifically, they find that macroeconomic conditions have a more significant effect in the long run, while in the short term, financial stress indicators—such as the VIX, which reflects market volatility and liquidity—play a more prominent role. Similarly, Eyysell et al. (2013), in their study on China, highlight that both domestic economic conditions and global factors, such as the VIX, term structure slope, and financial shocks, significantly influence CDS spreads. Doshi et al. (2017) further emphasize the importance of both economic factors and financial indicators, including the VIX, on CDS contracts in three regions: Europe, Asia, and Latin America, using a no-arbitrage model. Their findings show significant variability in predicted risk premiums, with a marked peak during the 2008 financial crisis for most countries.

In the literature, several studies examine the impact of global factors on CDS spreads. One such study is by Pan and Singleton (2008), who investigate the influence of global market dynamics on sovereign credit default swaps. They explore sovereign CDS spreads for three geographically dispersed countries (Mexico, Türkiye, and Korea) over the period from March 19, 2001, to August 10, 2006. Their analysis highlights the critical role of the VIX index in explaining the co-movements in CDS spreads across these countries, emphasizing that global factors, particularly shifts in investor sentiment and credit exposure, outweigh country-specific economic fundamentals. While the authors observe the presence of country-specific risks, especially in Türkiye and Mexico, they argue that the term structures of CDS spreads in these countries are predominantly influenced by broader global financial conditions. This aligns with the findings of Wang et al. (2010), who investigate the intertemporal causality between daily sovereign CDS returns and financial spread determinants in Latin America, including Mexico. Their study identifies those global factors such as the VIX, U.S. Treasury yields, and TED spreads are key predictors of CDS prices, and also highlights that exchange rates play a particularly crucial role in Mexico's CDS pricing. Both studies reinforce the notion that global financial factors, such as investor sentiment and market volatility, are crucial in explaining movements in sovereign CDS spreads, often surpassing the impact of domestic economic variables.

Extending this global focus, Wang and Yao (2014) examine the influence of global financial factors and the Greek sovereign debt crisis on sovereign CDS spreads in six Latin American countries during the period from August 10, 2006, to September 30, 2010. By utilizing pooled regression and GARCH models, their results indicate that increases in U.S. default yield spreads, TED spreads, and the VIX are consistently associated with higher CDS spreads and increased volatility in these countries. This study complements the findings of Fender et al. (2012), which investigates the determinants of sovereign CDS spreads for 12 emerging market countries, including Brazil, Russia, Türkiye, and others, during the period from April 2002 to December 2011. Fender et al. (2012) confirm that global and regional risk premiums dominate the movements in CDS spreads, particularly during the financial crisis, with U.S. bond, equity, and high yield returns, alongside emerging market credit returns, emerging as the most significant drivers. The substantial role of global financial conditions, as noted by both Wang and Yao (2014) and Fender et al. (2012), underscores the pervasive influence of global risk factors on sovereign CDS pricing in emerging markets, where domestic conditions often play a secondary role, especially in times of crisis.

Similarly, Longstaff et al. (2011) analyze sovereign credit risk using CDS data from 26 countries, including Türkiye, from October 2000 to January 2010. They find that sovereign credit spreads are more highly correlated across countries than equity returns, driven largely by global factors such as U.S. equity markets and high-yield bonds. Their study decomposes CDS spreads into risk-premium and default-risk components, showing that both components are heavily influenced by global macroeconomic factors, with the risk premium making up about one-third of the spread. This finding aligns with Ertuğrul and Öztürk (2013), who examine CDS markets in Brazil, Bulgaria, Mexico, Russia, South Africa, and Türkiye from January 2003 to March 2012, employing ARDL and SGARCH models. They show that CDS spreads reflect sovereign credit risk accurately, especially in countries with high external debt, and that long-term relationships exist between CDS spreads and bond markets. They also observe that rising bond yields tend to drive CDS spreads.

Furthermore, Stolbov (2017) investigates the relationship between Russian sovereign credit risk, measured by five-year CDS spreads, and its determinants from January 2001 to May 2015. His study identifies external factors, especially the VIX, Brent oil prices, global credit conditions (such as the TED spread), and changes in sovereign credit ratings (e.g., Fitch Ratings), have a greater influence on Russian CDS spreads than domestic macroeconomic variables. This complements the findings of Srivastava et al. (2016), who examine the relationship between VIX, sovereign bond yields, currency exchange rates, and CDS spreads in 56 countries from 2001 to 2010. The study identifies VIX as the most significant factor influencing sovereign CDS spreads, with a strong unidirectional effect from global financial sentiment to sovereign CDS prices, which also reinforces the importance of external risk factors in shaping sovereign credit risk, as seen in both Stolbov (2017) and Srivastava et al. (2016).

Bouri et al. (2017) examines the volatility transmission from global commodity markets to sovereign CDS spreads for 17 emerging markets, including Türkiye, and 6 frontier economies from June 2, 2010, to July 27, 2016. Using the Lagrange Multiplier (LM) causality test proposed by Hafner and Herwartz (2006), they find significant volatility spillovers, particularly from energy and precious metals to sovereign CDS spreads. The results vary by country and over time.

Abed et al. (2019) examines the interdependence between the daily Eurozone sovereign CDS index and four financial market sectors—bank CDS market (CDSb), sovereign bond market (BONDs), stock market (BMI), and the EuroBOBL interest rate benchmark—during different phases of the sovereign debt crisis, from September 20, 2011, to February 12, 2016. Using a dynamic conditional correlation (DCC) model within a multivariate fractionally integrated generalized ARCH (FIGARCH) framework, the study finds a pattern of fluctuating correlations between CDSs and market indicators, reflecting spillover effects and varying vulnerabilities across financial sectors during the crisis.

Aljarba et al. (2024) examine volatility spillovers among sovereign credit default swaps (SCDSs) of emerging economies, including Saudi Arabia, Russia, China, Indonesia, South Africa, Brazil, Mexico, and Türkiye, from January 2010 to July 2023. Using time-domain and frequency-domain connectedness approaches, they find that Indonesia, China, and Mexico are the main transmitters of sovereign credit risk volatility, while global factors like the VIX, economic policy uncertainty (EPU), and global political risk (GPR) significantly affect spillovers.

In summary, while each study highlights the specific context of the countries or regions analyzed, a common theme emerges global financial conditions, particularly the VIX index, U.S. Treasury yields, and broader market volatility, significantly shape sovereign CDS spreads. Country-specific factors, while important, often serve as secondary influences, especially in periods of financial uncertainty and crisis.

3. METODOLOGY

This study investigates impacts of the CBOE VXO Volatility Index (VXO) and the CBOE Volatility Index (VIX) on CDS premium in Türkiye, focusing on volatility spillovers rather than the more traditional first-moment causality techniques. The research specifically examines causality in higher moments, particularly variance, to explore how shocks in oil and market volatility influence credit risk, as reflected in CDS premium. By examining second-moment causality, the study aims to provide a deeper understanding of the indirect effects of oil and market volatility on the credit default swap market, which is a crucial indicator of sovereign credit risk.

To examine these volatility spillovers, two advanced econometric methods are employed. The first method involves multivariate GARCH

(Generalized Autoregressive Conditional Heteroskedasticity) models, which capture the joint volatility dynamics between CDS premium, VXO, and the CBOE Volatility Index. This approach allows for a comprehensive analysis of how VXO and VIX affect CDS premium, while also accounting for the interdependencies between these variables. The second method used is the causality in variance test developed by Hafner and Herwartz (2006), which focuses on univariate GARCH models to investigate the direction and strength of volatility spillovers between VXO, VIX, and CDS premium. Unlike first-moment causality tests, this approach examines how volatility shocks are transmitted across markets, providing a more detailed understanding of risk transmission. The Lagrange Multiplier (LM) approach used in this test helps to overcome issues such as sample size distortions and sensitivity to lead-lag structures, making it a reliable tool for empirical analysis of time-varying volatility spillovers. This method is particularly useful for understanding the changing dynamics of how international financial market uncertainty affect CDS premium in Türkiye.

In conclusion, we apply advanced econometric techniques to analyze the impact of VXO and the VIX on CDS premium in Türkiye, focusing on second-moment causality to capture the volatility transmission effects. By combining multivariate GARCH models and the causality in variance test, the study offers valuable insights into the influence market volatility on sovereign credit risk. The findings are expected to contribute to the understanding of how external volatility factors, such as global market risk, affect sovereign credit markets in emerging economies like Türkiye. This research provides important implications for policymakers, investors, and financial analysts monitoring sovereign risk and the broader financial stability of Türkiye.

3.1. DYNAMIC CONDITIONAL CORRELATION

This study applies a two-step estimation approach to model dynamic conditional correlations (DCC), based on the frameworks of Engle (2002) and Tse and Tsui (2002).

In the first step, univariate GARCH models are estimated for each asset to obtain the residuals and conditional variances. These results are used as inputs for the second step, where the DCC model estimates the time-varying correlations between assets.

The conditional covariance matrix Q_t is computed as:

$$Q_t = (1 - \sum_{m=1}^{M} \alpha_m - \sum_{m=1}^{M} \beta_m) Q + \sum_{m=1}^{M} \alpha_m \left(u_{t-m} u_{t-m}^{'} \right) + \sum_{m=1}^{M} \beta_m Q_{t-m} \tag{1}$$

The conditional correlation matrix R_t is then derived as:

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \tag{2}$$

where Q_t^{*} is the diagonal matrix of the square roots of the diagonal elements of Q_t. The correlation between assets i and j is given by:

$$p_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t} q_{jj,t}}} \tag{3}$$

For improved accuracy, Aielli (2013) proposes the corrected DCC (cDCC) model, which adjusts the second step of the estimation process to provide a more reliable correlation estimator. The corrected covariance matrix is:

$$Q_t = (1 - \sum_{m=1}^{M} \alpha_m - \sum_{m=1}^{M} \beta_m) Q + \sum_{m=1}^{M} \alpha_m \left(Q_{t-n}^{*1/2} u_{t-m} u_{t-m}^{'} Q_{t-m}^{*1/2} \right) + \sum_{m=1}^{M} \beta_m Q_{t-m} \tag{4}$$

Finally, Cappiello et al.'s (2006) asymmetric correlation model is used to account for the differing impacts of positive and negative shocks on asset correlations. The model is specified as:

$$Q_t = (1 - \sum_{m=1}^{M} \alpha_m - \sum_{m=1}^{M} \beta_m) Q - \sum_{k=1}^{K} \tau_k \bar{N} + \sum_{m=1}^{M} \alpha_m \left(u_{t-m} u_{t-m}^{'} \right) + \sum_{m=1}^{M} \beta_m Q_{t-n} + \sum_{k=1}^{K} \tau_k \left(n_t n_{t-k}^{'} \right) + \sum_{m=1}^{M} \beta_m Q_{t-m} \tag{5}$$

3.2. CAUSALITY IN VARIANCE

The volatility spillover test developed by Hafner and Herwartz (2006), based on the concept of the Lagrange multiplier (LM), addresses the limitations of the method proposed by Cheung and Ng (1996) and proves useful in empirical applications. The null hypothesis of no causality in variance is defined as follows:

$$H_0 = Var\left(\varepsilon_{it} | G_{t-1}^{(j)} \right) = Var\left(\varepsilon_{it} | G_{t-1} \right) \; i, j = 1, \ldots\ldots, N, i \neq j \tag{6}$$

where $G_t^{(j)}$ represents the information set containing past residuals from the GARCH model.

Next, the model $\varepsilon_{j\tau}$ is specified as:

$$\varepsilon_{it} = \xi_{it}\left(\sigma_{it}^2 ft\right)^{0.5},\ f_t = \eth + z_{jt}^{'} \quad,\ z_{jt} = \left(\varepsilon_{jt-1}^2,\ \ \sigma_{jt-1}^2\right)^{'} \tag{7}$$

In this context, f_t is an adjustment factor dependent on past squared residuals and conditional variances, where z_{jt} is a vector of these past terms. The GARCH model for the conditional variance σ_{it}^2 is given by:

$$\sigma_{it}^2 = \grave{u}_i + \alpha_i \varepsilon_{j,t-1}^2 + \beta_i \sigma_{j,t-1}^2 \tag{8}$$

A sufficient condition for the null hypothesis to hold is that $\pi = 0$, leading to the null hypothesis $H_0 : \pi = 0$ and the alternative hypothesis $H_0 : \pi \neq 0$.

The test statistic, derived based on the parameter π\pi$\pi$, is used to evaluate the null hypothesis.

The authors propose the following Lagrange Multiplier (LM) test statistics to test for volatility spillovers:

$$\lambda_{LM} = \left(0.25\left(\sum_{t=1}^{T}\left(\xi_{it}^2 - 1\right)z_{jt}^{'}\right)\right)v\left(\frac{1}{\theta_i}\right)\left(\sum_{t=1}^{T}\left(\xi_{it}^2 - 1\right)z_{jt}\right) \xrightarrow{d} x^2 \tag{9}$$

where ξ_{it} represents the standardized residuals, z_{jt} is a vector of explanatory variables, and the statistic follows a chi-squared distribution with 2 degrees of freedom.

The variance of the LM test statistics is given by:

$$V\left(\theta_i\right) = 0.25\frac{K}{T}\left(\sum_{t=1}^{T} z_{jt} z_{jt}^{'} - \sum_{t=1}^{T} z_{jt} x_{it}^{'}\left(\frac{1}{\sum_{t=1}^{T} x_{it} x_{it}^{'}}\right)\sum_{t=1}^{T} x_{it} z_{jt}^{'}\right) \tag{10}$$

where $K = \frac{1}{T}\sum_{t=1}^{T}\left(\xi_{it}^2 - 1\right)^2$, and x_{it} denotes the explanatory variables used in the model.

4. DATA

This study investigates the impact of global market volatility indices, specifically the CBOE OEX Volatility Index (VXO) and the CBOE SPX Volatility Index (VIX), on Türkiye's five-year Credit Default Swaps (CDS). The VIX data, covering the period from February 28, 2008, to November 27, 2024, and the VXO data, spanning from February 28, 2008, to August 30, 2021, reflect global market volatility and investor sentiment. Given that CDS premium are influenced by a country's perceived sovereign credit risk, this study explores how changes in global market volatility, as captured by these indices, can impact the fluctuations in Türkiye's CDS premium. Since global financial conditions and investor sentiment can affect emerging markets like Türkiye, examining this relationship helps to understand the broader context of Türkiye's sovereign risk and borrowing costs. All data used in this study, including CDS, VIX, and VXO indices, are sourced from DataStream.

The figure 1 shows the levels of the CDS premium, VIX, and VXO over time. Additionally, the variables CDS2, VIX2, and VXO2 represent the logarithmic differences of these indices, respectively. Between 2008 and 2022, significant fluctuations were observed in the CDS premium, VIX, and VXO indices. Following the 2008 global financial crisis, the CDS premium, VIX, and VXO reached their peaks; for example, in September 2008, the CDS premium rose to 283.09, and the VIX reached 31.16. This period reflects a high level of uncertainty and risk triggered by the bankruptcy of Lehman Brothers. In 2018, during Türkiye's currency crisis, the CDS premium rose to 311 due to concerns over the depreciation of the Turkish lira and external debt. In 2020, following the COVID-19 pandemic, global uncertainty led the CDS premium to increase to 518, while the VIX surged to 54.46. By 2022, during a period of economic crisis in Türkiye, the CDS premium peaked at 838, with both the VIX and VXO indices increasing, signaling heightened volatility. During this period, the rise in Türkiye's CDS premium became more pronounced due to a combination of domestic factors such as exchange rate fluctuations, inflation, and external debt payments, alongside global risk perceptions. Since 2016, while there have been periodic increases in the CDS premium, years such as 2017 and 2021 displayed more stable trends, shaped by global economic recoveries and domestic economic adjustments.

Figure 1: Time-series plots of level of volatility indices and the CDS premium

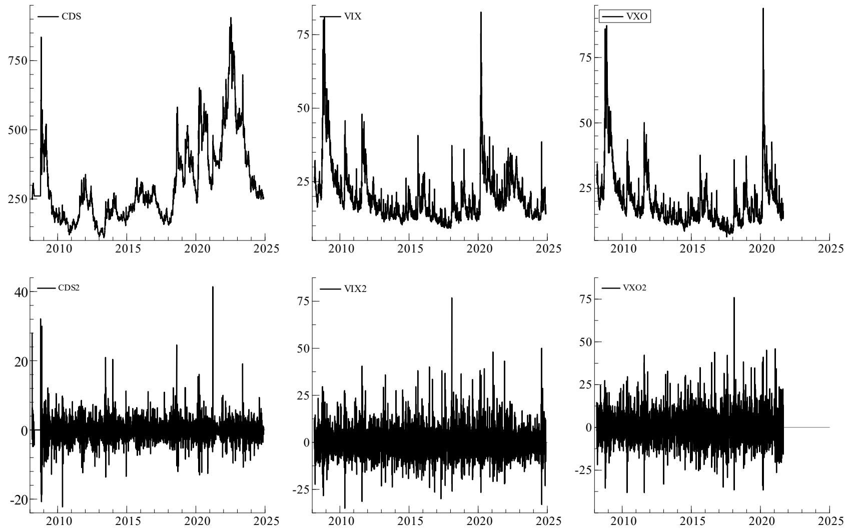


Table 1 shows the descriptive statistics for the VIX, VXO, and CDS premium datasets over different time periods. The VIX has an average value of 0.018 and a median of 0, with a standard deviation of 3.34, indicating moderate variability. In contrast, the VXO has a slightly negative average of -0.017, a median of -0.23, and a higher standard deviation of 8.66, reflecting more volatility. Both series have a positive skew, with the VIX being more positively skewed (1.55) compared to the VXO (0.75), suggesting that the VIX tends to have larger positive movements. The kurtosis values are also high for both series, especially for the VIX (22.05), which suggests the presence of extreme values more frequently than would be expected in a normal distribution. The Jarque-Bera tests indicate significant departures from normality for both datasets. For the CDS data, two distinct periods are analyzed: the first period has an average of -0.011, a median of -0.43, and a standard deviation of 7.48, while the second period has an average of 0.006, a median of 0, and a lower standard deviation of 3.18. These results highlight the significant variability and non-normality in the data. Finally, the results of the Augmented Dickey-Fuller (ADF) unit root test indicate that all series are stationary.

Tablo 1: Descriptive Statistics

	28.02.2008-30.08.2021		28.02.2008-27.11.2024	
	VXO	CDS	CDS	VIX
Mean	0.018	-0.017	-0.011	0.006
Median	0	-0.23	-0.43	0
Maximum	41.40	75.92	76.82	41.40
Minimum	-22.27	-38.14	-35.05	-22.27
Std. Dev.	3.33	8.65	7.48	3.18
Skewness	1.54	0.75	1.101	1.47
Kurtosis	22.05	7.64	9.60	22.06
Jarque-Bera	54670.6***	3503.18***	8821.82***	67769.19***
ADF Unit Root Test	-53.79***	-68.17***	-59.67***	-71.52***
Observations	3522	3522	4369	4369

Note: *** indicates significance at the 1% level

Tablo 2: Descriptive Statistics

	CDS	VIX	VXO
Constant (Mean)	-0.0337 (0.450)	-0.15736*** (0.000)	-0.20211** (0.014)
AR(1)	0.05593 (0.370)	0.823785*** (0.000)	0.73759*** (0.000)
MA(1)	0.095517 (0.124)	-0.90315*** (0.000)	-0.84468*** (0.000)
Constant (Variance)	1.022673*** (0.004)	9.034056*** (0.000)	11.98113*** (0.000)
ARCH	0.15864*** (0.000)	0.164429*** (0.000)	0.158835*** (0.000)
GARCH	0.732556*** (0.000)	0.673495*** (0.000)	0.677902*** (0.000)
$Q(20)$	(0.388)	(0.272)	(0.033)**
$Q_s(20)$	(0.999)	(0.184)	(0.467)

Note: *** and ** indicate statistical significance at 1 and 5%, respectively. $Q(20)$ and $Q_s(20)$ show the Box-Pierce test for standardized residuals and the Box-Pierce test for squared standardized residuals, respectively.

Table 2 presents the ARMA(1,1)-GARCH(1,1) model estimation results. In the assessment of stability criteria for the GARCH models estimated, it was observed that the parameters Constant (Variance), ARCH, and GARCH are statistically significant. Additionally, all coefficients in the variance equation are positive, and the sum of ARCH and GARCH parameters is less than one. These results suggest that the model demonstrates stability. ARCH parameter represents the impact of past volatility shocks, while the GARCH parameter measures the persistence of volatility in future periods. For the CDS series, the ARCH coefficient of 0.1586 indicates that past volatility shocks have a moderate impact on future volatility. The GARCH coefficient of 0.7326 suggests a high persistence of volatility, meaning past volatility has a substantial influence on future volatility. In the VIX series, the ARCH coefficient of 0.1644 shows that past volatility significantly impacts future volatility. The GARCH coefficient of 0.6735 also indicates strong volatility persistence, though slightly lower than that of the CDS series, suggesting volatility remains influential over time but with a somewhat weaker effect. Similarly, for the VXO series, the ARCH coefficient of 0.1588 and the GARCH coefficient of 0.6779 indicate that past volatility plays a significant role in explaining future volatility, with a high persistence in volatility similar to the other two series.

Tablo 3: Akaike Information Criteria for Different DCC-GARCH Model Results

	DCC	cDCC	ADCC	cADCC
AIC for CDS-VIX	11.15326	11.15453	11.15346	11.15307
AIC for CDS-VXO	11.5357	11.5350	No Converge	No Converge

Table 3 presents the Akaike Information Criterion (AIC) results for the four different DCC-GARCH models estimated, including DCC, cDCC, ADCC, and cADCC. To determine the optimal model, AIC values for each model were compared for both the CDS-VIX and CDS-VXO. For the CDS-VIX, the AIC values were very close across all models, with the lowest AIC value of 11.15307 obtained from the cADCC model. For the CDS-VXO, the cDCC model yielded the lowest AIC value of 11.5350, while the ADCC and cADCC models failed to converge. Based on the AIC criterion, the cADCC model for CDS-VIX and the cDCC model for CDS-VXO are considered the most appropriate models.

Tablo 4: Akaike Information Criteria for Different DCC-GARCH Model Results

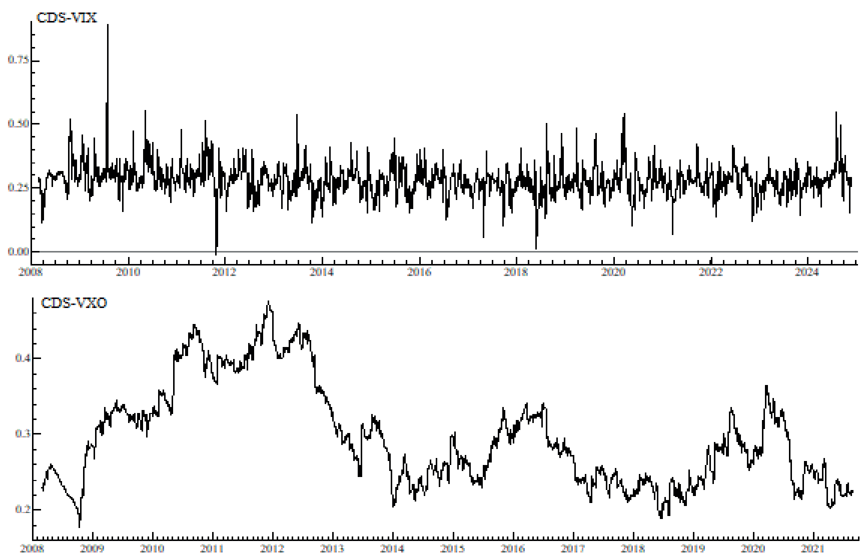
	CDS-VIX	CDS-VXO
alpha	0.038924*** (0.000)	0.00534*** (0.000)
beta	0.846096*** (0.000)	0.993341*** (0.000)
gamma	-0.06813*** (0.000)	-
$Q(20)$	(0.000)	(0.000)
$Q_s(50)$	(0.06)	(0.362)

Note: The values in parentheses represent the probability values. *** indicates significance at the 1% level

Table 4 shows DCC-GARCH model estimation results. Upon examining the DCC parameters for CDS-VIX and CDS-VXO, it is evident that both the Alpha and Beta parameters are statistically significant at the 1% significance level. The Alpha coefficient, which represents the short-term dynamics of volatility, is positive for both series, indicating that past volatility shocks significantly influence future volatility. The Beta coefficient, reflecting the persistence of volatility over time, is high for both (0.8461 for CDS-VIX and 0.9933 for CDS-VXO), suggesting that volatility shocks have a long-lasting effect. A high Beta value, particularly for CDS-VXO, implies a strong persistence of volatility over time. The Gamma parameter for CDS-VIX is negative and statistically significant, indicating that negative information shocks tend to reduce the conditional correlation between the volatility of two series.

Figure 2 presents the dynamic correlations for the CDS-VIX and CDS-VXO. The time-varying correlation between Türkiye's five-year CDS premium and the VXO, derived from a corrected DCC-GARCH model, exhibits a positive relationship over the sample period. The correlation was lowest in 2009, after which it showed a significant upward trend, peaking at approximately 0.5. However, starting in 2013, the correlation began to decline, which could indicate a decoupling of Türkiye's financial markets from global risk factors. During the COVID-19 pandemic, the correlation rose again, reaching around 0.4, suggesting that the global crisis heightened the interconnectedness between Türkiye's sovereign credit risk and global risk sentiment. This pattern reflects a shift in the relationship dynamics, particularly following the global financial crisis and during the COVID-19 period, illustrating that both markets became more responsive to global risk factors in times of heightened uncertainty. A similar trend can be observed in the dynamic correlation between the CDS premium and VIX, where the correlation surged following the 2008 financial crisis, reaching levels as high as 0.8. During the COVID-19 period, this correlation was approximately 0.6, further indicating that, like Türkiye's CDS and the VXO, the global risk sentiment—as captured by the VIX—had a substantial impact on credit risk during periods of global financial distress.

Figure 2: Time Varying Correlation



The causality-in-variance test results presented in Table 5 show a significant causal relationship from VIX (global financial market volatility) to Türkiye's CDS premium, with an LM statistic of 43.541 and a p-value of 0.0000, which is significant at the 1%, 5%, and 10% levels. This indicates that increases in global financial market volatility are associated with higher CDS premiums for Türkiye, reflecting heightened concerns about its credit risk. In contrast, the causality from CDS to VIX is not significant, with an LM statistic of 1.215 and a p-value of 0.5447, suggesting that fluctuations in Türkiye's CDS premium do not influence global market volatility. Furthermore, the variance causality test results in Table 5 reveal a significant causal relationship from VXO to CDS premium, with an LM statistic of 43.541 and a p-value of 0.0000. However, the causality from CDS premium to VXO is not significant, as indicated by an LM statistic of 1.215 and a p-value of 0.5447. These findings suggest that global volatility indices (VIX and VXO) influence Türkiye's CDS premium, but Türkiye's CDS premium does not have a significant impact on global market volatility.

Tablo 5: Causality-in-variance Test Results

	LMstat	p-value
VIX → CDS	81.126***	0.0000
CDS → VIX	1.652	0.4379
VXO → CDS	43.541***	0.0000
CDS → VXO	1.215	0.5447

Note: *** indicates significance at the 1% level

CONCLUSION

This study investigates the impact of global market volatility indices, specifically the CBOE OEX Volatility Index (VXO) and the CBOE SPX Volatility Index (VIX), on Türkiye's five-year Credit Default Swaps (CDS). The VIX data, covering the period from February 28, 2008, to November 27, 2024, and the VXO data, spanning from February 28, 2008, to August 30, 2021, reflect global market volatility and investor sentiment during these periods. The analysis utilizes advanced econometric techniques, including multivariate GARCH models and the causality in variance test, to investigate volatility spillovers and causal relationships between the volatility indices and CDS premium. The findings reveal a significant time-varying correlation between Türkiye's CDS premium and global volatility indices, particularly during periods of heightened global financial uncertainty, such as the 2008 Global Financial Crisis and the 2020 COVID-19 pandemic. The results show that global financial conditions, as reflected in the VIX and VXO, play a critical role in determining fluctuations in Türkiye's CDS premium. The dynamic correlations suggest that during global financial crises, there is a heightened interconnectedness between Türkiye's sovereign credit risk and global market volatility. This relationship becomes particularly pronounced during times of crisis, highlighting the importance of considering both domestic and international factors in assessing sovereign risk. Furthermore, the study's use of second-moment causality analysis emphasizes the role of volatility transmission, rather than simply first-moment causality, providing deeper insights into how market volatility shocks influence sovereign credit risk. The findings contribute to the literature by exploring the asymmetric effects of global market volatility on sovereign CDS premium and offering a more comprehensive understanding of the dynamics at play. Overall, this research highlights the growing significance of global financial volatility as a determinant of sovereign credit risk, particularly for emerging markets like Türkiye. The results have important implications for policymakers and investors, suggesting that global risk factors must be closely monitored to manage sovereign credit risk effectively, especially during periods of market instability. By considering both time-varying correlations and causal relationships, this study provides valuable insights into the evolving dynamics of Türkiye's CDS premium in response to global financial volatility.

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