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THE CAUSALITY RELATIONSHIP BETWEEN CREDIT DEFAULT SWAPS (CDS) AND PORTFOLIO INVESTMENTS: THE CASE OF TÜRKİYE

Kredi Temerrüt Takasları (CDS) ile Portfolyo Yatırımları Arasındaki Nedensellik İlişkisi: Türkiye Örneği

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Abstract

This study examines the causality relationship between portfolio investments and credit default swaps (CDS) in Türkiye. Analysing the dynamics between portfolio investments and CDS premiums, two important variables for financial markets is critical to understanding how risk perception and investment decisions are affected. While portfolio investments are generally considered an indicator of the confidence of foreign investors in the country's economy, CDS premiums are an important risk measure that reflects the country's debt risk and the risk perception of market participants. In this context, examining the relationships between the two variables contributes to the understanding of the effects of investor behavior and risk perception on macroeconomic indicators in financial markets. In the study, the Granger causality test was applied using data from the period 2014Q1-2024Q1. The results obtained show that CDS premiums have a significant and unidirectional causal effect on portfolio investments. Increases in CDS premiums increase investors' risk perception and lead to a decrease in portfolio investments. On the other hand, no causal effect of portfolio investments on CDS premiums was found. These findings emphasize the importance of risk management in terms of portfolio investments in Türkiye and reveal that CDS premiums play a role in investor decisions.

Keywords:
Credit Default Swaps, Portfolio Investments, Granger Causality Test.

JEL Codes:
G11, D81, C10

Öz

Bu çalışma, Türkiye'deki portföy yatırımları ile kredi temerrüt takasları (CDS) arasındaki nedensellik ilişkisini incelemektedir. Finansal piyasalar için önemli iki değişken olan portföy yatırımları ve CDS primleri arasındaki dinamiklerin analiz edilmesi, risk algısının ve yatırım kararlarının nasıl etkilendiğini anlamak açısından kritik öneme sahiptir. Portföy yatırımları, genellikle yabancı yatırımcıların ülke ekonomisine duyduğu güvenin bir göstergesi olarak kabul edilirken, CDS primleri ise ülkenin borçlanma riskini ve piyasa katılımcılarının risk algısını yansıtan önemli bir risk ölçütüdür. Bu bağlamda, iki değişken arasındaki ilişkilerin incelenmesi, finansal piyasalarda yatırımcı davranışlarının ve risk algısının makroekonomik göstergeler üzerindeki etkilerinin anlaşılmasına katkı sağlamaktadır. Çalışmada, 2014Q1-2024Q1 dönemine ait veriler kullanılarak Granger nedensellik testi uygulanmıştır. Elde edilen sonuçlar, CDS primlerinin portföy yatırımları üzerinde anlamlı ve tek yönlü bir nedensellik etkisi olduğunu göstermektedir. CDS primlerindeki artışlar, yatırımcıların risk algısını yükselterek portföy yatırımlarında azalmaya yol açmaktadır. Buna karşın, portföy yatırımlarının CDS primleri üzerinde herhangi bir nedensellik etkisi bulunmamıştır. Bu bulgular, Türkiye'de portföy yatırımları açısından risk yönetiminin önemini vurgulamakta ve CDS primlerinin yatırımcı kararlarında rol oynadığını ortaya koymaktadır.

Anahtar Kelimeler:
Kredi Temerrüt Swapları, Portföy Yatırımları, Granger Nedensellik Testi.

JEL Kodları:
G11, D81, C10

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1. Introduction

The global economy has witnessed radical transformations in the structure of financial markets and investments, along with the rapid changes experienced in the last few decades. Investors are reshaping their risk management strategies in response to the increasing speed and diversity of international capital flows. In this regard, financial instruments such as portfolio investments and CDS play a critical role in investment decisions and market stability. While portfolio investments have become an important tool in global investors' search for a risk-return balance, CDS premiums have increased their importance in the international financial system as an indicator of countries' credit risk. On a global scale, especially in emerging markets, CDS premiums stand out as a factor that directly affects investors' risk perceptions and directs capital movements.

While the integration of financial markets and the liberalization of capital flows around the world offer significant opportunities in ensuring the economic stability of developing countries, they have also brought about serious risks. Financial volatility in these countries can shake investors' confidence and lead to capital outflows. In this context, CDS premiums are used as a critical tool for measuring country risk and detecting potential economic crises in advance. In this regard, the relationship between portfolio investments and CDS premiums emerges as an important research area for understanding global financial stability.

Türkiye continues to be an attractive target for global investors with its strategic geographical location, dynamic economy, and emerging market structure. However, increasing geopolitical risks, macroeconomic uncertainties and domestic political fluctuations in recent years have caused significant volatility in Türkiye's financial markets. This volatility has affected investors' risk perception and led to significant fluctuations in portfolio investments. Türkiye's credit risk and the effects of this risk on financial markets are particularly notable with the recent increase in CDS premiums. This situation necessitates a more in-depth examination of the relationship between portfolio investments and CDS premiums in Türkiye.

The aim of this study is to investigate the causality relationship between portfolio investments and CDS premiums in Türkiye. For this purpose, the study first examines the relevant literature review and the existing theoretical and empirical findings on the relationship between portfolio investments and CDS premiums. There are findings in the literature that CDS premiums reflect investors' risk perception and that this perception can affect capital flows. However, the effect of portfolio investments on CDS premiums has been addressed more limitedly in the literature, and there is a need for a comprehensive analysis in this area. Following the theoretical information and literature review provided in the first section of the study, the relationship between portfolio investments and CDS premiums is examined graphically and comparatively using data specific to Türkiye. This examination provides a visual assessment of the relationship between both variables, revealing the change in investor behavior and risk perception over time. The graphical analysis reveals the tendency of portfolio investments and CDS premiums to move together and potential causal relationships. The method used in the study focuses on determining the dynamic relationships between these two variables with the Granger causality test. The Granger causality test is a frequently used econometric method in revealing the causal relationships between time series. In the study, the causality relationship between portfolio investments and CDS premiums was examined using quarterly data for the period 2014Q1-2024Q1. The reason for choosing this method is the effectiveness of the Granger causality test in

determining whether a time series can predict the future values of another time series. The test results reveal the direction and strength of the causality relationship between the two variables, thus providing a clearer understanding of the relationship between portfolio investments and CDS premiums for Türkiye. As a result, this study provides important contributions both theoretically and practically. Theoretically, a better understanding of the relationship between portfolio investments and CDS premiums can shed light on investors' decision-making processes. In practice, it allows policy makers to develop strategic recommendations for risk management and ensuring financial stability. At the end of the study, various policy recommendations are presented to support financial stability in Türkiye. These recommendations aim to reduce vulnerabilities in Türkiye's financial markets and increase investor confidence.

2. Conceptual Framework

Portfolio investments allow investors to invest in securities such as bonds and stocks in other countries to gain profit by assuming various risks (exchange rate risk, political risk, commercial risk, etc.). In this case, risk diversification is considered important as it provides high returns (Yıldırım and Sakızcı, 2019: 2780). Investors need to monitor the macroeconomic indicators of the countries in which they will invest to know their risk status. One of the most widely used macroeconomic indicators for monitoring country risk is credit rating. The ratings assigned to countries by international rating agencies such as Moody's, Standard & Poor's, and Fitch are an important indicator of the risks that investors will face if they invest in these countries. However, the bankruptcies of banks that were given high credit ratings by credit rating agencies prior to the 2008 global financial crisis undermined the credibility of credit rating agencies. This has increased the importance of CDS in analyzing the macroeconomic situation of countries. Today, most portfolio investors still consider the ratings assigned by credit rating agencies when making investment decisions, but they also consider CDS in their country risk analyses.

2.1. Credit Default Swaps (CDS)

The development of financial markets in the 1990s led to the emergence of new methods to hedge or minimize credit risk, which refers to the possibility of non-repayment of debt. One of the most widely used financial instruments among these methods is credit derivatives. Credit derivatives are financial assets that allow the transfer of credit risk to a third party without the financial asset with credit risk changing hands. One of the financial instruments with the highest trading volume among credit derivatives is CDS (Kunt and Taş, 2009: 80). CDS are, broadly speaking, insurance contracts to hedge financial risks. CDS is a financial instrument that hedges the risk of default of the financial asset subject to the contract. The parties involved in CDS and their operation mechanism are given in Figure 1 (Brandon and Fernandez, 2005: 8):

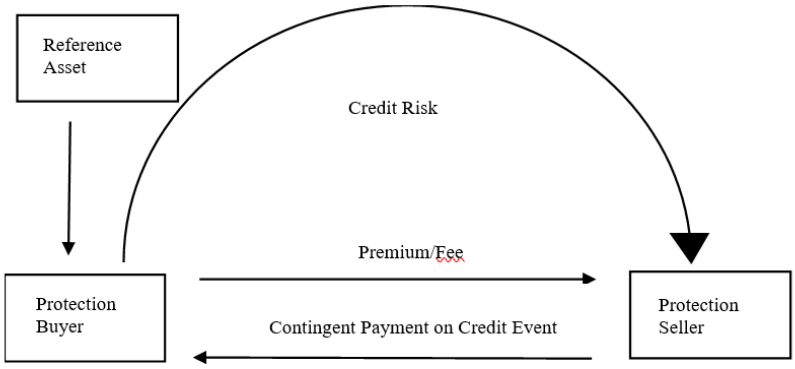


Figure 1. Operation Mechanism of CDS
Source: Brandon and Fernandez, 2005: 8.

There are two parties to CDS: the protection buyer and the protection seller. The protection buyer is obliged to pay pre-determined premiums periodically until the contract matures or defaults. The protection seller, on the other hand, assumes the risk that arises when the security subject to the contract defaults or the debtor fails to pay its debt or goes bankrupt (Weistroffer, 2009: 4). In short, the protection seller minimizes its financial risk by transferring the risk of non-payment of its receivable to the protection buyer. However, in the occurrence of a credit event specified in the contract (default, bankruptcy, etc.), the protection seller has to pay the protection buyer all or part of the debt under the CDS contract.

CDS have many advantages, such as being the most liquid assets among credit derivatives, not having the distortions caused by certain covenants in bonds (early call, etc.), directly reflecting the effect of interest rates in credit risk analysis, and allowing direct comparison of default risk across countries (Cossin and Jung, 2005: 5). Due to these advantages, CDS have found their place in the literature as an important macroeconomic indicator used to monitor country risk, which refers to the probability of a country not being able to fulfill its obligations. The theoretical positive correlation between country risk and CDS premiums allows the estimation of country risk by analyzing the country CDS.

CDS can be issued by countries, as well as by institutions such as companies and banks. While the CDS issued by institutions are based on their credits, bonds, bills, etc., the country CDS are issued with reference to the government bonds and Eurobonds of the country (Görmüş and Aksoylu, 2017: 204). On the other hand, CDS are financial instruments that can be used not only for hedging purposes but also for arbitrage and speculation. Through the CDS they purchase, financial institutions such as banks both transfer their risks to other persons or institutions and provide security for themselves at a lower cost than methods such as portfolio diversification, credit sales, or securitization. CDS can also be used to simply trade different asset portfolios when they are expected to be mispriced or move in a certain direction. This is considered a factor that increases the liquidity of the CDS market (Sevil and Ünkaracalar, 2020: 287-288).

Figure 2 was prepared to compare 5-year CDS premiums of countries around the world regionally. CDS premiums represent the amount investors pay as insurance against the risk of a country not being able to repay its debts. High CDS premiums indicate that a country has a high credit risk and may have difficulty repaying its debts, while low CDS premiums indicate more reliable and economically stable countries.

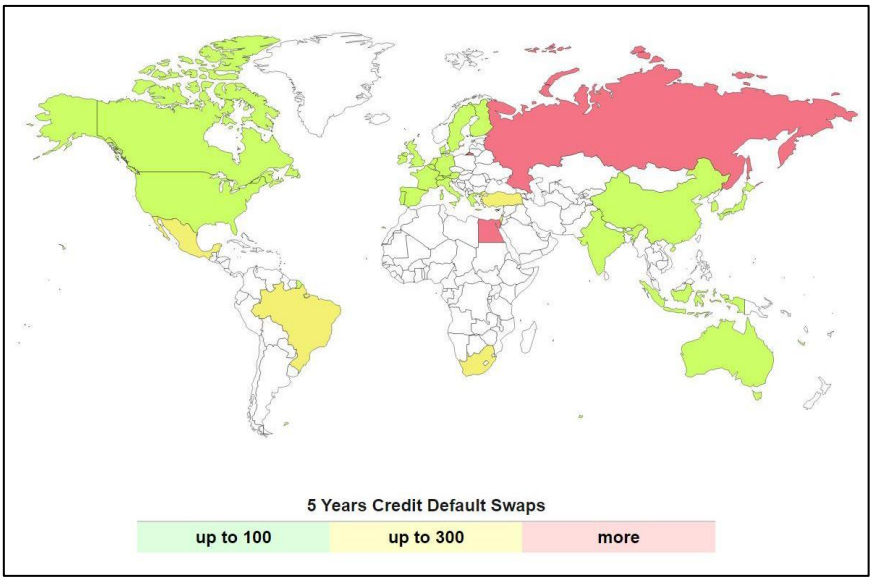
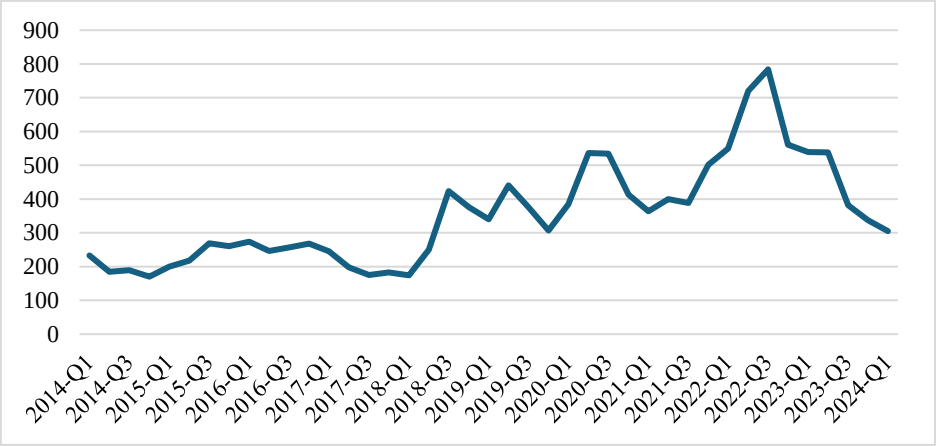


Figure 2. 5-Year CDS Premiums
Source: worldgovernmentbonds (2023)

According to Figure 2, countries shown in green on the map have CDS premiums below 100 basis points (i.e. 1%). These countries include countries with strong and stable economies such as the USA and Canada in North America, and Germany, France, and the United Kingdom in Western Europe. Low CDS premiums in these countries indicate that investors have a low-risk perception towards these countries, meaning that they provide strong assurance in repaying their debts. Countries shown in yellow are countries with CDS premiums between 100 and 300 basis points. This category includes countries with medium credit risk, and Türkiye is in this group. Türkiye's CDS premium has exceeded 100 basis points but not 300 basis points. This situation shows that Türkiye is facing economic instability and uncertainty, but it has not yet entered the high-risk group. Countries shown in red have CDS premiums above 300 basis points, and these countries are high-risk regions. Countries such as Russia are included in this category on the map. High CDS premiums in these countries reflect that investors have serious concerns about these countries and see significant risks in repaying their debts.

Graph 1 shows the quarterly changes in Türkiye's CDS premiums from the first quarter of 2014 to the first quarter of 2024. According to Graph 1, CDS premiums generally ranged between 200 and 400 basis points between 2014 and 2018, but a significant upward trend was observed starting from the third quarter of 2018 and reached approximately 600 basis points in the third quarter of 2020. Although CDS premiums fluctuated in 2021 and 2022, they generally remained at high levels and peaked at over 800 basis points in the third quarter of 2022. A gradual decline is observed in CDS premiums as of 2023 and it is observed that they have decreased to approximately 300 basis points in the first quarter of 2024. This decline can be associated with the improvement in global market conditions, economic policies implemented in Türkiye and improvements in country risk perception.



Graph 1. Quarterly Change in Türkiye's CDS Premiums (2014Q1 - 2024Q1)

2.2. Portfolio Investments

International investments are generally analyzed under two groups: foreign direct investments (FDIs) and portfolio investments. FDIs refer to investments made by firms from one country in another country, either by establishing a new facility or purchasing an existing facility for production and other purposes. Portfolio investments, on the other hand, are international investments made through the purchase of foreign securities (bonds, stocks, etc.) (Seyidoğlu, 2016: 95). In other words, portfolio investments are defined as cross-border transactions and positions involving securities such as debt or equity securities, other than those included in FDIs (IMF, 2009: 110). Within the framework of these explanations, it can be said that portfolio investments provide investors with the opportunity to earn income by assuming various risks (exchange rate risk, political risk, commercial risk, etc.).

Portfolio investments are an important economic factor for most countries, regardless of their level of development, and countries implement various policies to attract these investments. Behind the policies implemented by countries to attract portfolio investments are the benefits these investments offer.

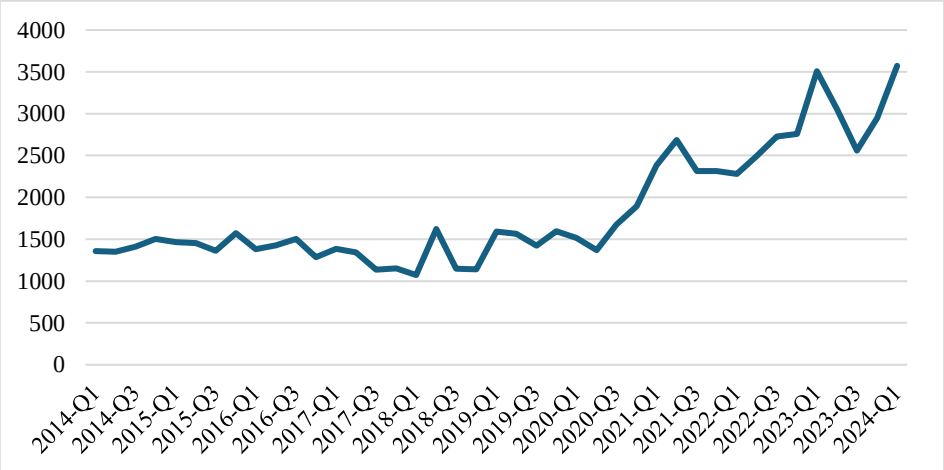
Portfolio investments offer several benefits to the countries they go to. These include providing a source of finance for the country, which is particularly important for nations with limited financial resources. They also help in increasing the investment rate in countries with low domestic savings, ensuring that these economies can grow despite internal financial constraints (Pal, 2010: 3; Shanab, 2017: 1470). Additionally, portfolio investments are crucial in enabling countries experiencing foreign exchange shortages to overcome the foreign exchange bottleneck, thereby stabilizing their economies. Another significant advantage is reducing the cost of financing by increasing the price-to-earnings ratio, making it cheaper for businesses and governments to access funds. Lastly, portfolio investments contribute to increasing liquidity by deepening financial markets, which enhances the efficiency and resilience of financial systems.

While portfolio investments provide the above-mentioned benefits to invested (host) countries, they also cause various disadvantages for them. The first disadvantage is undermining the independence of the host country's economic policy. Countries dependent on foreign investments have to implement policies aimed at retaining these investments in the country or attracting new ones (e.g., contractionary monetary policy). Also, the high liquidity of portfolio

investments increases the risk of these investments leaving the country (repatriation). This may increase the vulnerability of the host country and lead to a financial crisis (Esen, 1998: 62-63). However, despite these risks, portfolio investments play an important role in growth and development, especially in developing countries.

For portfolio investments to enter a country or be effective within the country, certain conditions must be met. If these conditions are not met, investments will flow to other countries. In this context, the factors affecting portfolio investments include the integration of domestic markets with foreign markets (liberalization of financial markets), stock market performance, economic growth, exchange rate, country risk, global liquidity, and interest rates. While there is an inverse relationship between country risk and portfolio investments, the direction of the relationship between other factors and portfolio investments is considered positive (Şenol and Selahattin, 2018: 3-6).

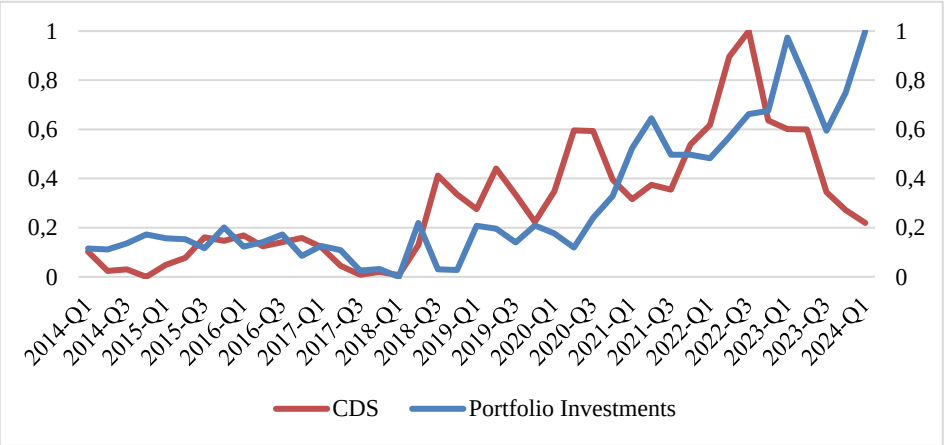
Graph 2 shows the quarterly change in portfolio investments in Türkiye in million US dollars from the first quarter of 2014 to the first quarter of 2024. According to Graph 2, it is observed that portfolio investments generally remained at a relatively constant level between 1 and 1.5 billion dollars with minor fluctuations between 2014 and 2018. A significant upward trend started at the end of 2019 and continued until the end of 2021. This increase can be considered to be related to global financial conditions and expectations regarding the Turkish economy. While fluctuations in portfolio investments increased from 2022 onwards, the general trend continued to increase and reached its highest level at approximately 3.5 billion dollars in the first quarter of 2024. Sudden increases and decreases in investments can reflect the effects of economic factors such as global market conditions, Türkiye's risk premium, changes in exchange rates, and interest rates. The increase observed especially after 2020 indicates the recovery after the 2019 Covid-19 pandemic and the increasing interest in emerging markets, while the reason for the recent high volatility can be evaluated as the increasing perception of uncertainty among investors regarding the Turkish economy or the frequent changes in short-term positions.



Graph 2. Quarterly Change in Portfolio Investments in Türkiye (2014Q1 - 2024Q1, Million USD)

2.3. Graphical Analysis of the Relationship between Portfolio Investments and CDS

Under this heading, the relationship between CDS and portfolio investments is examined graphically for Türkiye. The statistical normalization method was applied to the CDS and portfolio investment data for the 2014Q1 and 2024Q1 periods. This method, which is used especially to eliminate scale differences, brings together variables with different variables or features, different scales, or units on a common scale. Thus, comparisons can be made between data with different measurement units. These data, which are shown between 0 and 1, are shown without changing their qualities and importance levels. In this context, the statistical normalization method was applied to CDS and portfolio investment variables and both variables are shown on the same graph in Graph 3 in order to make a more accurate comparison.



Graph 3. Graphical Analysis of the Relationship between Portfolio Investments and CDS-Türkiye

As seen in Graph 3, portfolio investments show fluctuations over time. These fluctuations may be affected by factors such as investor confidence, market conditions, economic policies and global economic developments. There is an increase in portfolio investments from 2014-Q4 to 2015-Q1. This increase may be an indicator of positive expectations in the economy. There are some fluctuations after 2015-Q1. Such fluctuations may generally indicate market uncertainties or changes in risk perception. On the other hand, it is observed in the chart that CDS premiums also show fluctuations. There is a sharp decrease in CDS premiums especially in 2014-Q4, which indicates that investors have more confidence in the country's debt repayment ability during that period. There are some increases in CDS premiums after 2014-Q4, which may indicate that risk perception has increased and investors' concerns about debt repayment risk have increased. When the relationship between CDS and portfolio investments is examined holistically, portfolio investments generally increase when CDS premiums are low. This may mean that investors invest more in periods when they trust the country's economic stability and see low debt risk. Similarly, when CDS premiums increase, there are also periods when portfolio investments tend to decrease. This indicates that investors act more cautiously and reduce their investments in periods when they think debt risk is increasing. The significant changes observed in portfolio investments and CDS premiums in 2014-Q4 can be explained by specific economic events or policy changes experienced during that period. For example, economic reforms, monetary policy changes or

international agreements may cause such fluctuations. It is observed that there is a relationship between CDS and portfolio investments, when Graph 3 is taken into consideration.

3. Literature Summary

The first study on CDS was conducted by Duffie (1999), followed by Hull and White (2000), Hull and White (2001), and Skinner & Townend (2002). These studies are regarded as the pioneers of other studies on CDS (Kunt and Taş, 2009: 80). In the subsequent years, CDS gained significant prominence in the economics literature, both due to their increasing weight in financial markets and as a crucial indicator in the risk analysis of countries. A summary of the studies in the literature is given in Table 1. While the first part of the table includes the studies examining the relationship between CDS and other variables, the second part covers the studies on the relationship between CDS and portfolio investments.

Table 1. Literature Summary

Studies on the Relationship between CDS and Other Macroeconomic Variables					
Author	**Country**	**Period**	**Variables**	**Method**	**Finding**
Skinner and Townend (2002)	29 countries	1997:09-1999:02	CDS, risk-free interest rate, maturity, volatility	Regression analysis	Risk-free interest rate, reference asset, volatility, and maturity > CDS
Fung et al. (2008)	USA	2001:01-2007:12 daily data	CDS, US Stock Market	VAR	CDS > stock market
Remolona et al. (2008)	24 countries	2002:01-2006:05	CDS, VIX, RTI	Dynamic panel data model	VIX and RTI > CDS
Plank (2010)	6 countries	2001:01-2009:12	CDS, external debt	Model created by the author	External debt + CDS
Bektur and Malcıoğlu (2017)	Türkiye	12.10.2000-17.02.2017	CDS, BIST 100	Hatemi-J causality	CDS → BIST 100
Çonkar and Vergili (2017)	Türkiye	04.01.2010-31.08.2015	CDS, USD/TRY exchange rate	Johansen cointegration, Granger causality	USD/TRY → CDS
Danacı et al. (2017)	Türkiye	2009Q2-2015Q2	CDS, growth	Toda-Yamamoto	CDS ↔ growth
Yüksel and Yüksel (2017)	19 countries	9.10.2009-3.06.2013	CDS, VIX Index	Threshold GARCH	CDS + VIX
Topaloğlu and Ege (2019)	Türkiye	2010:01-2019:06	CDS, BIST 100	Cointegration, Granger causality	CDS - BIST 100, CDS → BIST 100
Dural and Sarıoğlu (2020)	9 developing countries	2005Q1-2016Q2	CDS, real exchange rate	Heterogeneous panel data analysis	CDS - real exchange rate
Bayrakdaroglu and Mirgen (2021)	BRICS	2015-2021 quarterly data	CDS, stock index	Panel data	CDS - stock index
Demir and Dinç (2021)	Türkiye	02.01.2015-31.12.2020	CDS, USD/TRY exchange rate	Toda-Yamamoto causality	CDS → USD/TRY
Münyas and Bektur (2021)	Türkiye	03.01.2005-31.12.2009	CDS, VIX Index	ARDL	A 1 unit increase in CDS increases the VIX index by 0.102 units.
Çetin (2022)	Türkiye	2010:04-2021:01	CDS, exchange rate	Granger causality	CDS → exchange rate

Table 1. Continue

Studies on the Relationship between CDS and Portfolio Investments

Author	Country	Period	Variables	Method	Finding
Norden and Weber (2009)	USA, EU countries	02.07.1998-02.12.2002	CDS, stock, stock market	VAR	Stock → CDS and stock market
Coronado et al. (2011)	8 European countries	2007-2010	CDS, stocks (credit and market risk)	Panel data- VAR	CDS ↔ stocks
Ratner and Chiu (2013)	USA	2004-2011	CDS, stock	GARCH	CDS → stocks
Marzona et al. (2014)	UK, USA, and Japan	2004:01-2013:12	CDS, stock	OLS regression	CDS > stocks
Cho and Rhee (2014)	USA and selected Asian countries	2003–2012	CDS, indirect and direct investments	Panel regression analysis	CDS > indirect and direct investments
Koy (2014)	8 countries	2009:01-2012:11	CDS, eurobond	Granger causality	CDS → Bonds in Türkiye, Italy, and France
Kahıloğulları (2018)	Türkiye	2005:01-2017:09	CDS, portfolio investments	ARDL	CDS * portfolio investments, CDS ** portfolio investments
Koy and Karaca (2018)	Türkiye	2013-2016 weekly data	CDS, net portfolio investments	Markov regime-switching VAR	Net portfolio investments - CDS
Yıldırım and İldokuz (2018)	Türkiye	2005-2014	CDS, portfolio investments	VAR	CDS > portfolio investments
Akyol and Baltacı (2019)	Türkiye	2005Q2-2018Q4	CDS, portfolio investments	ARDL	Portfolio investments > CDS
Yıldırım and Sakızcı (2019)	Türkiye	2010:Q1-2018:Q3	CDS, portfolio investments	ARDL	CDS → Portfolio investments
Sevil and Ünkaracalar (2020)	Türkiye	2010-2018 quarterly data	CDS, portfolio investments	Johansen cointegration, Granger causality	Portfolio investments → CDS
İlter and Gök (2021)	Türkiye	2005Q4-2019Q3	CDS, portfolio investments	Fourier causality	CDS ↔ portfolio investments
Suyadal et al. (2021)	18 developed and developing countries	2009:1-2019:3	CDS, portfolio investments	Heterogeneous panel causality	CDS → portfolio investments

Note: → One-way causality, ↔ Two-way causality, * Long-run relationship, ** Short-run relationship, + Positive relationship, - Negative relationship, > There is relationship, x There is no relationship.

4. Econometric Analysis

In this study, quarterly data for the period 2014: Q1-2024: Q1 are used to determine the causality relationship between CDS and portfolio investments in Türkiye, and the variables are included in the analysis in their logarithmic versions in order to clearly identify the changes in the variables. Information on the variables is given in Table 2.

Table 2. Information on Variables

Variables	Description	Unit	Source
logcds	Natural Logarithm of CDS Premiums/ Quarterly Data	US Dollar	Datastream
logp	Natural Logarithm of Portfolio Investments/ Quarterly Data	Million USD	EVDS (Central Bank of the Republic of Türkiye - Electronic Data Delivery System)

4.1. Method

One of the basic assumptions of time series is the stationarity of the series. Stationarity denotes that the means and variances of the series used are constant over time, and their covariances between two periods depend on the distance between the two periods. Since analyses conducted with non-stationary or unit root series lead to spurious regression problem, the reliability of the analysis disappears regardless of the high R^2 value and statistically significant F statistics (Gujarati, 2016: 319-320). Based on these explanations, prior to examining the relationships between the variables, an investigation was conducted to determine whether the variables contained unit roots. For this purpose, the augmented Dickey–Fuller (ADF) test, developed by Dickey and Fuller (1979), and the Phillips–Perron (PP) unit root test, developed by Phillips and Perron (1988), were conducted.

The Granger causality test, developed by Granger (1969), was used to determine whether there was a causality relationship between the variables. The purpose of the Granger causality test is to determine whether there is causality between variables and, if such causality exists, to identify the direction of causality. The equations for the Granger test conducted in this study are as in Equation 1 and Equation 2:

$$CDS_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} CDS_{t-i} + \sum_{j=1}^{q} \delta_{1i} Portfolio_{t-i} + \varepsilon_{1t} \quad (1)$$

$$Portfolio_t = \alpha_1 + \sum_{j=1}^{p} \beta_{2i} Portfolio_{t-i} + \sum_{j=1}^{q} \delta_{2i} CDS_{t-i} + \varepsilon_{2t} \quad (2)$$

Equation 1 and Equation 2 represent two sets of equations created to analyze the causality relationship between CDS and portfolio investments with the Granger causality test. These equations are used to test whether there is a causal relationship between time series. What each coefficient represents is explained as follows:

α_0 and α_1 (Constant Terms): These coefficients are constant terms included in both equations. They represent the average values of the time series and are included as a constant component in the model.

β_{1i} and β_{2i} (Coefficients of Lagged Values): The coefficients β_{1i} in the first equation represent the coefficients of the lagged values of the CDS series itself. These coefficients show the effect of the past values of the CDS series on the current CDS value. The coefficients β_{2i} in the second equation represent the coefficients of the lagged values of the portfolio investment series. These coefficients show the effect of the past values of the portfolio investment series on the current portfolio investment value.

δ_{1i} and δ_{2i} (Coefficients of Lagged Values of Other Series): The coefficients δ_{1i} in the first equation represent the effect of the lagged values of the portfolio investment series on CDS. These coefficients determine the effect of the past values of the portfolio investment series on the current CDS value. The coefficients δ_{2i} in the second equation represent the effect of the lagged values of the CDS series on portfolio investments. These coefficients determine the effect of the past values of the CDS series on the current portfolio investment value.

ε_{1t} and ε_{2t} (Error Terms): The error terms in both equations represent random deviations that the model cannot explain.

These coefficients are used to test whether there is an interaction between two time series in the Granger causality test. For example, if the coefficients δ_{1i} are statistically significant, this may indicate that the past values of the portfolio investment series Granger cause the CDS series. Similarly, if the coefficients δ_{2i} are significant, it means that the past values of the CDS series Granger cause the portfolio investment series.

4.2. Findings

The reliability of the results given by the variables used in time series analyses depends on the stationarity of the variables. Analyses conducted with non-stationary series are considered erroneous in the literature. Therefore, the ADF and PP unit root tests were conducted to investigate the stationarity of the variables of CDS and portfolio investments. The results obtained from the ADF unit root test are presented in Table 3. The ADF unit root test results indicate that although the series are non-stationary at their level values, when first differences are taken, t statistic values are greater than the critical values in absolute terms in all three models (constant, constant and trend, no constant and no trend). In this regard, according to the ADF unit root test results, the series are stationary at their first differences.

Table 3. ADF Unit Root Test Results

Variables	SIC	ADF Test Statistic		
		Constant and Trend	Constant	No Constant and No Trend
Level				
logcds	3/3/4	--2.6036	-2.1915	0.2302
logp	0/2/2	-2.3366	0.3200	1.6055
First Difference				
dlogcds	3/3/3	-3.1215	-3.0549*	-3.1067*
dlogp	1/1/1	-6.7212*	-6.4968*	-6.1733*

Notes: * indicates 1% significance level. SIC indicates the optimal lag length based on the Schwarz information criterion.

In the ADF unit root test, it is assumed that the error terms are independent and have constant variance. In the PP unit root test, on the other hand, these assumptions are changed, and possible dependence and heteroscedasticity in error terms are taken into account, and stationarity is investigated by nonparametric methods (Gujarati and Porter, 2018: 758). Due to this difference in assumptions between the two tests, stationarity is usually analyzed by conducting both tests in the literature. In this regard, the PP unit root test results are presented in Table 4. The PP unit root test results indicate that although the series are non-stationary at their level values when first differences are taken, t statistic values are greater than the critical values in absolute terms in all three models (trend, trend, and intercept and none). In this regard, according to the PP unit root test results, the series are stationary at their first differences. Therefore, the PP test and the ADF test yielded similar results.

Table 4. PP Unit Root Test Results

Variables	PP Test Statistic		
	Trend and Intercept	Intercept	None
Level			
logcds	-2.2583	-1.5721	0.0826
logp	-2.0475	-0.6315	1.6217
First Difference			
dlogcds	-5.1392*	-5.1177*	-5.1704*
dlogp	-10.117*	-8.5011*	-7.6584*

Notes: * indicates 1% significance level.

After establishing that both series were stationary at their first differences, the Granger causality test based on the vector autoregression (VAR) system was conducted. In tests based on the VAR model, the optimal lag length should be determined first. Thus, the lag lengths of the VAR model are given in Table 5. Based on Table 5, the optimal lag length is 2.

Table 5. Optimal Lag Lengths

Lag Length	LogL	FPE	LR	SC	AIC	HQ
0	25.85273	0.000944	NA	-1.202260*	-1.289337	-1.258638
1	31.85978	0.000848	11.03999*	-1.136596	-1.397826	-1.305730
2	37.08208	0.000796*	9.033156	-1.028513	-1.463896*	-1.310403*

Notes: * Indicates the lag length based on the selected criteria. FPE: Final Prediction Error. LR: Sequentially modified LR test statistic (each test at the 5% level). SC: Schwarz Criterion. AIC: Akaike Information Criterion. HQ: Hannan–Quinn Information Criterion

Another preliminary test of the VAR model is the autocorrelation test, which tests the relationship between error terms with the expectation of no autocorrelation. The LM test, shown in Table 6, was employed to examine whether the model exhibited autocorrelation. The results for both lags are as follows: "The probability value of the LM test is greater than the 0.10 significance level; H_0: is accepted". Thus, it was concluded that the model did not exhibit autocorrelation.

Table 6. LM Autocorrelation Test Results

Null hypothesis: No serial correlation at lag h						
Lag	**LRE* stat**	**df**	**Prob.**	**Rao F-stat**	**df**	**Prob.**
1	2.071250	4	0.7227	0.518069	(4, 60.0)	**0.7227**
2	0.736126	4	0.9468	0.182111	(4, 60.0)	**0.9468**
Null hypothesis: No serial correlation at lags 1 to h						
Lag	**LRE* stat**	**df**	**Prob.**	**Rao F-stat**	**df**	**Prob.**
1	2.071250	4	0.7227	0.518069	(4, 60.0)	**0.7227**
2	4.043945	8	0.8531	0.496615	(8, 56.0)	**0.8535**

Notes: *Edgeworth expansion corrected likelihood ratio statistic.

Another condition necessary for the VAR model to be reliable is that it is stationary and stable. To test this condition, the AR characteristic roots of the model are examined. The model is considered stationary if the AR roots are within the unit circle or their absolute values are less than 1. Figure 3 shows that the AR polynomial roots are within the unit circle, confirming that the model is stationary and stable.

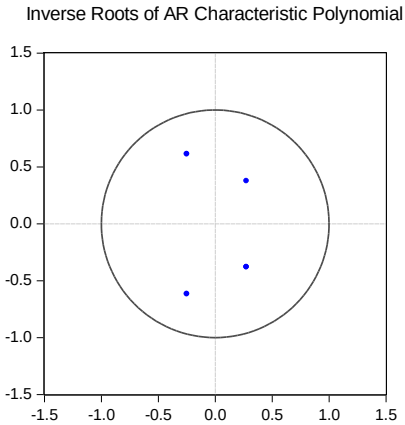


Figure 3. AR Polynomial Roots

The last test assessing the reliability of the VAR model is the heteroscedasticity test. For the model to be statistically reliable, there should be no heteroscedasticity problem in the model. According to the results of the heteroscedasticity test presented in Table 7, since the test probability values are greater than 0.10, the null hypothesis "there is no heteroscedasticity" cannot be rejected. Therefore, it is accepted that the model does not exhibit heteroscedasticity.

Table 7. Heteroscedasticity Test Results

Joint Test					
Chi-Square Statistics	**Lag Length**	**Probability Value**			
19.51355	24	0.7241			
Individual components:					
Dependent Variable	**R-squared**	**F(8,29)**	**Prob.**	**Chi-sq(8)**	**Prob.**
res1*res1	0.174920	0.768515	0.6328	6.646970	0.5752
res2*res2	0.054253	0.207950	0.9870	2.061621	0.9791
res2*res1	0.182617	0.809887	0.5995	6.939454	0.5432

All tests conducted to assess the applicability of the VAR model revealed that the model was reliable, and the Granger causality test could be performed. The results of the Granger causality test conducted to determine whether there is any causality relationship between portfolio investments and CDS are presented in Table 8.

Table 8. Granger Causality Test Results

Dependent Variable: dlogcds			
Independent Variable	**Chi-Square**	**Lag Length**	**Probability Value**
dlogp	3.676403	2	**0.1591**
All	3.676403	2	**0.1591**
Dependent Variable: dlogp			
Independent Variable	**Chi-Square**	**Lag Length**	**Probability Value**
dlogcds	7.198157	2	**0.0273**
All	7.198157	2	**0.0273**

According to the Granger causality test results in Table 8, it is concluded that portfolio investments (dlogp) do not have a significant effect on CDSs (dlogcds) (p-value 0.1591). This situation shows that past values of portfolio investments do not provide additional information in estimating future values of CDSs. When this result is evaluated from an economic perspective, it can be interpreted that changes in portfolio investments do not create a change in CDS premiums, therefore investors do not price the risk in CDSs depending on the changes in portfolio investments. In other words, according to the results obtained, portfolio investments do not directly affect the perceived credit risk (measured by CDS premiums) in the market. On the other hand, the results obtained show that CDSs (dlogcds) have Granger causality on portfolio investments (dlogp) (p-value 0.0273). This situation shows that past values of CDSs provide additional information in estimating future values of portfolio investments. When this result is evaluated from an economic perspective, it can be interpreted that CDS premiums (credit risk) affect portfolio investments. Investors may be reconsidering their portfolio decisions by considering CDS premiums. Increasing CDS premiums indicate increased perceived risk, which may cause investors to shift to less risky assets or reduce their portfolio investments. As a result, according to the one-way causality relationship obtained, changes in CDS premiums may affect portfolio investments, but changes in portfolio investments do not affect CDS premiums. This shows that risk perception (measured by CDS premiums) plays an important role in investment decisions in financial markets, but investment movements do not have a significant effect on risk premiums. This result means that investors carefully monitor CDS premiums in risk management, but changes in portfolio investments do not directly change these risk premiums.

The findings of this study concluded that CDSs are the cause of portfolio investments and are similar to the studies conducted by Ratner and Chiu (2013), Koy (2014), Yıldırım and Sakızcı (2019) and Suyadal et al. (2021). These results show that this study is generally consistent with the literature examining the relationship between CDS premiums and portfolio investments. However, the study results also have differences compared to some studies in the literature. For example, Shahzad et al. (2016) found in their study that CDS premiums affect stock markets and that there is a bidirectional causality relationship in some sectors. In contrast, this study found that CDS premiums have only a unidirectional causality effect on portfolio investments. On the other hand, García et al. (2017) concluded that CDS premiums have an effect on bond spreads, but there is no reverse causality, which is also consistent with the findings of this study. In

addition, Badaoui et al. (2014) found that there is a strong relationship between CDS premiums and the bond market, but no market consistently leads the other, which supports the effect of CDS premiums on portfolio investments, as in this study. Münyas (2020) stated that CDS premiums have a strong effect on markets in the context of Türkiye, but this effect varies depending on market conditions, which is similar to the findings of this study. On the other hand, Ballester et al. (2021) emphasized that CDS premiums affect stock market volatility, but this relationship can become bidirectional during crisis periods, which is similar to the results of this study, supporting the effect of CDS premiums on risk perception. When a holistic comparison is made, the general results of these studies, similar to the findings obtained from this study, reveal that CDS premiums negatively affect portfolio investments by increasing investors' risk perception and that there is generally a one-way relationship, but it may vary according to market dynamics. However, the reason for the differences between some studies in the literature and the findings obtained from this study can be shown as the different countries and periods examined and the use of different methods.

5. Conclusion and Recommendations

Credit risk management has become a serious issue in the modern era. The difficulty of obtaining real-time information about the borrower, uncertainty, default risk, moral hazard, financial crises, and various other factors make credit risk management more difficult. For this reason, instruments such as CDS and practices aimed at effective credit risk management have become more commonly utilized since the 2008 global financial crisis. Investors purchase a CDS contract from a CDS company operating specifically in CDS markets. Thus, a kind of insurance is purchased against the risk that the credit will not be repaid. In return for the insurance premiums they pay, investors transfer the current risk to the insurer. In this way, CDS serves as a vital indicator that enables more efficient allocation of credits and provides a simpler, clearer, more reliable, and more transparent picture of investors' risk exposure. On the other hand, many developing countries today need foreign investments to sustain their economic progress due to reasons such as low savings rates and scarcity of foreign exchange. At this point, portfolio investments stand out due to their high liquidity conversion speed. Portfolio investments, considered risky investments because of their ability to exit a country quickly in the face of possible risk, as well as their high liquidity conversion speed, are deemed attractive investments for short-term economic solutions as they provide a source of financing for many countries facing foreign exchange and savings shortages. In this context, the fact that there is an inverse relationship between country risk and portfolio investments makes it imperative for portfolio investors to analyze the risk indicators of the country they are investing in. The credit ratings provided by credit rating agencies were considered a country risk indicator by both investors and economists for many years. However, the bankruptcy of highly rated institutions in the 2008 global financial crisis brought the reliability of credit ratings into question. These developments led to the consideration of CDS premiums as a country risk indicator.

In this study, the causality relationship between portfolio investments and CDS for Türkiye and the 2014Q1-2024Q1 time period is examined using the Granger causality test. The results obtained show that CDS premiums have a significant effect on portfolio investments. This situation reveals that investors in Türkiye take into account the changes in CDS premiums when making portfolio decisions and tend to reduce their portfolio investments in case these premiums

increase. In other words, CDS premiums play an important determining role in portfolio investments in Türkiye. However, it was found that portfolio investments do not have a significant effect on CDS premiums. This result shows that changes in portfolio investments in Türkiye do not directly affect the perceived credit risk in the markets. Investors do not price the increase or decrease in portfolio investments as a change in CDS premiums, therefore portfolio investments do not play a role as a determining factor in risk premiums. These findings offer important implications in terms of financial markets and investor behavior in Türkiye. In particular, it is seen that the increase in CDS premiums negatively affects portfolio investments by increasing risk perception. Therefore, economic and financial policymakers should take into account that CDS premiums play a critical role among the factors that drive investors' risk perception in Türkiye. Control and management of CDS premiums can be considered an important tool to ensure the sustainability of portfolio investments.

The contribution of this study to the literature is the detailed examination of the causal relationship between CDS premiums and portfolio investments for a specific time period (2014Q1-2024Q1) in Türkiye. In the existing literature, studies examining the relationship between CDS premiums and portfolio investments are generally limited and most studies have not comprehensively revealed whether there is a bidirectional or specific causality between these two variables. The difference in this study is that it clearly demonstrates the effect of risk perception on portfolio movements by detecting a unidirectional causality relationship from CDS premiums to portfolio investments. This finding fills the gap in the literature by providing new and original information for policymakers and investors in terms of risk management and economic stability and makes a valuable contribution to existing research. The fact that it includes specific and periodic analyses, especially for emerging markets such as Türkiye, makes the study unique in the literature.

Especially in emerging markets such as Türkiye, CDS premiums are generally considered an indicator of country risk. The findings obtained in this study show that the increase in CDS premiums in Türkiye increases investors' risk perception and leads to a decrease in portfolio investments, which may therefore affect the stability of financial markets. However, the fact that changes in portfolio investments do not have a significant effect on CDS premiums suggests that these investments do not directly shape the risk perception in the markets. In light of these findings, various policy recommendations can be made to ensure financial market stability in Türkiye and encourage portfolio investments. First of all, in the context of strengthening macroeconomic stability, high CDS premiums generally indicate high macroeconomic uncertainties and risks. In order to ensure economic stability and support sustainable growth in Türkiye, it is important to maintain fiscal discipline, combat inflation, and create a predictable economic environment. These policies can increase investors' confidence by reducing CDS premiums. In terms of improving external debt management, reducing Türkiye's external debt burden and increasing its debt payment capacity can contribute to reducing CDS premiums. In this context, careful management of external borrowing and strengthening of reserves are of strategic importance. In the context of measures to increase investor confidence, deepening and increasing the transparency of financial markets in Türkiye in the context of financial reforms can strengthen investor confidence. In particular, reforms supporting the development of capital markets and improving corporate governance standards can be steps that will increase portfolio investments. Improving international relations is another suggestion. Because CDS premiums are generally affected by international political risks. Reducing uncertainties in Türkiye's

international relations, ensuring stability in foreign policy, and minimizing international disputes can positively affect portfolio investments by reducing risk perception. In the context of crisis management and preventive measures, developing early warning systems against crisis risk during periods when CDS premiums increase rapidly can help prevent sudden increases in portfolio investments. Such systems can identify potential risks in advance and ensure that necessary measures are taken. Finally, the Central Bank can intervene with foreign exchange reserves and other monetary policy tools when excessive fluctuations are observed in the markets. These interventions can protect investor confidence by controlling sudden increases in CDS premiums.

Declaration of Research and Publication Ethics
This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

Researcher's Contribution Rate Statement
The authors declare that they have contributed equally to the article.

Declaration of Researcher's Conflict of Interest
There is no potential conflicts of interest in this study.

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