Ekonomi, Politika & Finans Araştırmaları Dergisi, 2022, 7(2): 301-315
Journal of Research in Economics, Politics & Finance, 2022, 7(2): 301-315
Araştırma Makalesi / Research Article, DOI: 10.30784/epfad.1085420

ANALYSIS OF RELATIONS BETWEEN CDS, STOCK MARKET, AND EXCHANGE RATE: EVIDENCE FROM COVID-19

CDS, Borsa ve Döviz Kuru Arasındaki İlişkilerin Analizi: Covid-19'dan Kanıtlar

Erkan USTAOĞLU*

Abstract

The aim of the study is to investigate the relationships between CDS, the BIST100 index, and the USD/TRY exchange rate during the Covid-19 period. For this purpose, the study used the frequency domain causality test developed by Breitung and Candelon (2006). According to the results of the study, during the Covid-19 period, a bidirectional causality relationship was detected between CDS and BIST100 index, and while this relationship occurred in the short and medium-term from CDS to BIST100 index, it was detected in all periods from BIST100 index to CDS. In other words, it can be stated that while the causality from CDS to BIST100 index is not permanent, causality from BIST100 index to CDS is permanent. Similarly, during the Covid-19 period, a bidirectional causality relationship was detected between CDS and USD/TRY exchange rate, and while this relationship occurred in the short and medium-term from CDS to USD/TRY exchange rate, it was detected in all periods from USD/TRY exchange rate to CDS. In other words, it can be stated that while the causality from CDS to USD/TRY exchange rate is not permanent, the causality from USD/TRY exchange rate to CDS is permanent.

Keywords:
CDS, BIST, USD/TRY Exchange Rate, Breitung and Candelon, Frequency Domain Causality.

JEL Codes:
C32, G10, G17.

Öz

Çalışmanın amacı, CDS, BIST100 endeksi ve Dolar/TL kuru arasındaki ilişkileri Covid-19 döneminde araştırmaktadır. Bu amaçla çalışmada, Breitung ve Candelon'un (2006) geliştirdiği frekans alanında nedensellik testi kullanılmıştır. Analiz sonuçları doğrultusunda, Covid-19 döneminde CDS ile BIST100 endeksi arasında karşılıklı nedensellik ilişkisi tespit edilmiş olup bu ilişki CDS'den BIST100 endeksine doğru kısa ve orta dönemde gerçekleşirken, BIST100 endeksinden CDS'e doğru tüm dönemlerde tespit edilmiştir. Diğer bir ifade ile Covid-19 döneminde CDS'den BIST100 endeksine doğru nedensellik kalıcı değilken, BIST100 endeksinden CDS'e doğru olan nedenselliğin kalıcı olduğu ifade edilebilir. Benzer bir şekilde Covid-19 döneminde CDS ile Dolar/TL kuru arasında karşılıklı nedensellik ilişkisi tespit edilmiş olup bu ilişki CDS'den Dolar/TL kuruna doğru kısa ve orta dönemde gerçekleşirken, Dolar/TL kurundan CDS'ye doğru tüm dönemlerde tespit edilmiştir. Diğer bir ifade ile Covid-19 döneminde CDS'den Dolar/TL kuruna doğru nedensellik kalıcı değilken Dolar/TL kurundan CDS'e doğru olan nedenselliğin kalıcı olduğu ifade edilebilir.

Anahtar Kelimeler:
CDS, BIST, Dolar/TL Döviz Kuru, Breitung ve Candelon, Frekans Alanında Nedensellik.

JEL Kodları:
C32, G10, G17.

* Dr. Lecturer, Hitit University, Vocational School of Social Sciences, Turkey.
ustaogluerkan@hotmail.com, ORCID: 0000-0002-4932-356X.

Makale Geliş Tarihi (Received Date): 10.03.2022 Makale Kabul Tarihi (Accepted Date): 28.06.2022

1. Introduction

Market and credit risks are among the significant risks encountered in contracts arising from investment and trading activities. Market risk arises from movements and changes in financial prices and rates. The components of market risk are exchange rate, interest rate, equity value, and precious metal/commodity price risks. On the other hand, credit risk is the risk arising from the failure of persons or institutions engaged in financial investment and commercial activities to fulfill their contractual obligations (Bolak, 2016: 9-10). Credit risk includes not only the failure of companies to pay their debts but also the failure of governments to pay off debt instruments such as government bonds and treasury bills. Credit derivative products are a tool that investors often use to protect themselves from credit risk (Acaravci and Karaomer, 2017: 261). The most popular credit derivative products are credit default swap (CDS) (Hull, 2008: 572).

CDS was first introduced by the investment bank J.P. Morgan in 1994 and has grown rapidly since then (Fu et al., 2021: 2204). Especially since 2000, CDS has been of increasing importance. CDS is like an insurance contract that insures the counterparty against the default risk when a particular company or country defaults (Hull, 2008: 178, 572). More specifically, CDS is a financial contract in which protection buyer A buys reference asset B in exchange for a CDS premium from a protection seller against default of C (Anagnostou et al., 2021: 1502). Here, the insurance premium, known as the CDS spread, is the premium that investor A pays for the contract purchased against C's default on asset B (Hull, 2008: 178). In CDS contracts, the investor who receives the CDS contract by paying the CDS premium acquires the right to sell the bonds issued by the holding country or company at their face value when a default occurs, and the insurance seller agrees to purchase the bonds at their face value when a default occurs (Hull, 2008: 572). The operation of CDS contracts is shown in Figure 1.

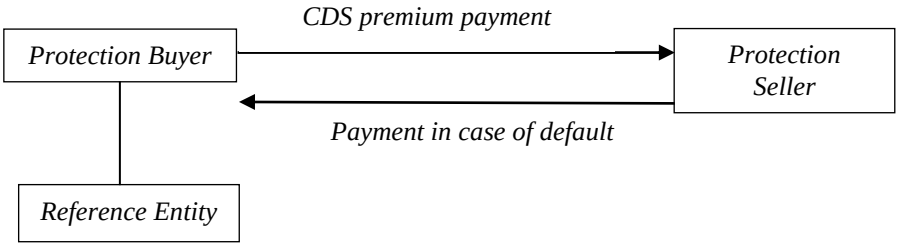

Figure 1. How CDS Works
Source: Choudhry, 2006

The CDS contract is an important indicator that explains the country risks beyond the insurance process of the investors. The higher the CDS contract premium of a country, the higher the cost of borrowing. At the same time, a high CDS spread indicates a high risk of default. In summary, a high CDS spread for the country negatively affects the investments to be made in that country and the investors' risk perception (Sarıgül and Şengelen, 2020). International credit rating agencies can also determine the risk status of countries. However, in recent years, the inability of these institutions to act fairly and transparently and their inability to be a leading indicator for financial crises has further increased the importance of CDSs as a risk indicator. An important advantage of CDS compared to other risk indicators is that they are formed daily and therefore reflect immediate situations.

The political, economic, and social developments in the country are closely related to CDS. Adverse developments in these areas lead to a deterioration in economic and financial indicators, an increase in the country's risk premium, and, consequently, a rise in CDS spreads. As a result of increasing CDS spreads, international investors may tend to exit the stock markets and cause liquidity problems in the markets. In addition, increased CDS spreads are expected to raise interest rates. Because the higher the CDS spread, the higher the borrowing cost will be, and in this case, it will inevitably be reflected in the interests (Arzova et al., 2020: 26-27). In addition to all these, it is expected that there will be a bidirectional relationship between exchange rates and CDSs, mainly due to the foreign exchange-dependent economic structures of developing countries.

The Covid-19 outbreak severely affected all financial markets (Ustaoglu, 2022: 1). At the same time, the Covid-19 pandemic has led to a massive increase in uncertainty, causing stock market volatility to rise to historical levels (Apergis et al., 2022: 2). The Covid-19 crisis has thrown companies into cash flow crises, causing disruptions in their day-to-day operations. This situation left companies with low liquidity and urgent financing needs vulnerable to the risk of default (Liu et al., 2021: 15). Another effect of the Covid-19 outbreak was on country CDS spreads. The impact of Covid-19 on country CDS spreads occurs in two ways. It is primarily due to the increased risk of default with Covid-19. The second is related to the fact that Covid-19 has increased risk premiums. Both situations increase country CDS spreads (Pan et al., 2021: 288). Considering the serious effects of Covid-19 on country risk and financial markets, the determination of the effects of CDS spreads, especially on the fragile exchange rates and stock market indices of developing countries, will be very important for many decision-makers in macroeconomic policy, investment decisions and portfolio management.

The aim of the study is to investigate the relationships between CDS, the BIST100 index, and the US Dollar/Turkish Lira (USD/TRY) exchange rate during the Covid-19 period. For this purpose, the study used the frequency domain causality test developed by Breitung and Candelon (2006). Since Covid-19 has severely affected Turkey as well as the whole world, it will be essential to examine the relations between CDS, BIST100 index, and USD/TRY exchange rate during the Covid-19 pandemic period in order to guide investors and policymakers. To the best of our knowledge, our study is the first to examine these relationships during the Covid-19 period. In addition, unlike other studies, the frequency domain causality test used in our study provides information about the short, medium, and long-term causality relationships, unlike classical causality tests. This study is expected to contribute to the literature by revealing the short, medium, and long-term relationships between CDS, BIST100 index, and USD/TRY exchange rate in the Covid-19 period. The rest of the study is as follows: The relevant literature is mentioned in the second chapter. In the third chapter, the data set and methodology of the study are presented. The fourth chapter presents the study results, and the last part states the findings and recommendations.

2. Literature

The relationships between CDS, BIST100 index, and USD/TRY exchange rates have been investigated by different authors through different periods and different econometric methods. In Table 1, Panel A and Panel B, studies on Turkey and others emerging markets are reported, respectively.

Table 1. Summary Results of Related Literature Search

Author (Year)	Country	Period	Variables	Method	Result
Panel A: Studies on Turkey					
Esen et al. (2015)	Turkey	22.04.2013-15.04.2014	CDS, BIST100, and others	Dumitrescu-Hurlin (2012) causality test	Causality: CDS ⇔ BIST100
Celik and Koc (2016)	Turkey	08.10.2008-09.06.2016	CDS, BIST100	Granger causality test	Causality: CDS ⇔ BIST100
Degirmenci and Pabuccu (2016)	Turkey	2010-2015	CDS, BIST100	Granger causality test, and others	Causality: CDS ⇔ BIST100
Eren and Basar (2016)	Turkey	2005:12-2014:03	CDS, BIST100, and others	ARDL cointegration test	Cointegration: Cointegrated While CDS has a positive effect on BIST100 in the long-term, this effect is negative in the short-term.
Acaravci and Karaomer (2017)	Turkey	01.02.2012-01.02.2017	CDS, BIST100	Granger causality test	Causality: There is no causality
Conkar and Vergili (2017)	Turkey	04.01.2010-31.08.2015	CDS, USD/TRY, EUR/TRY	Johansen cointegration test, Granger causality test	Cointegration: No cointegration Causality: USD/TRY ⇒ CDS
Ozpinar et al. (2018)	Turkey	2005:09-2017:02	CDS, USD/TRY, and others	Johansen cointegration test, Granger causality test, and others	Cointegration: Cointegrated There is a positive relationship between USD/TRY and CDS both in the long and short run. Causality:USD/TRY ⇒ CDS
Sovbetov and Saka (2018)	Turkey	2008:01-2015:05	CDS, BIST100	ARDL cointegration test	Cointegration: Cointegrated There is an inverse relationship between CDS and BIST100.
Sahin and Ozkan (2018)	Turkey	2012-2017	CDS, BIST100, USD/TRY, EUR/TRY	Granger causality test	Causality: CDS ⇔ BIST100 There is no causal relationship between CDS and exchange rates.
Bildirici et al. (2019)	Turkey	26/07/2005-22/08/2019	CDS, BIST100	Causality test, and others	Causality: CDS ⇔ BIST100
Sadeghzadeh (2019)	China, South Korea, Turkey, and others	2007:12-2018:04	CDS, Stock markets index	Panel causality and panel cointegration test	Cointegration: Cointegrated China, South Korea and Turkey. Causality: CDS ⇒ Stock markets

Table 1. Continued

Avci (2020)	Turkey	2003Q1-2018Q4	CDS, BIST100	Johansen and Gregory-Hansen cointegration test, Toda-Yamamoto causality test	Cointegration: Cointegrated Causality: BIST100 ⇒ CDS
Evci (2020)	Turkey	04.01.2010-04.07.2019	CDS, BIST100	Johansen cointegration tet, Granger causality test	Cointegration: Cointegrated Causality: CDS⇒ BIST100
Topaloglu and Ege (2020)	Turkey	2010:01-2019:06	CDS, BIST100	Several different cointegration tests, Granger causality test, and others	Cointegration: Cointegrated Causality: CDS ⇒ BIST100
Bayhan et al. (2021)	Turkey	11.03.2020-14.04.2021	CDS, USD/TRY	Frequency domain causality test	Causality:Only in the long-term USD/TRY ⇒ CDS There is no causality between CDS and USD/TRY in the long, medium and short-term.
Gok and Kara (2021)	Turkey	2005:04–2020:11	CDS, USD/TRY, and others	Frequency domain causality test	Causality: In the short and medium-term USD/TRY ⇔ CDS
Iltas and Guzel (2021)	Turkey	2010:01-2020:06	CDS, BIST100, and others	Toda-Yamamoto, Fourier Toda-Yamamoto Granger causality test	Causality: CDS ⇔ BIST100
Sarıtas et al. (2021)	Turkey	2010:02-2020:02	CDS, BIST100, and others	ARDL cointegration test	Cointegration: Cointegrated CDS spreads affect BIST100 index negatively.
Panel B: Studies on Others Emerging Markets					
Chan et al. (2009)	China, South Korea, Indonesia, Malaysia, Philippines, Thailand, and others	2001:01-2007:02	CDS, stock markets index	Johansen cointegration tet, Granger causality test	Cointegration: Cointegrated China, South Korea and Thailand. Causality: CDS ⇒ Malaysia CDS ⇔ Indonesia and the Philippines
Longstaff et al. (2011)	17 emerging markets and others	2000-2007	CDS, exchange rate	Cluster analysis and others	In general, CDS and exchange rate bidirectional affect each other in emerging markets.
Keblowski (2011)	Czech Republic, Hungary, Poland, and other	2001:01-2011:04	CDS, exchange rate and others	Panel VECM	In the Czech Republic, Hungary and Poland, CDS affects the exchange rate.
Coronado et al (2012)	Greece and orthers	2007:01-2010:06	CDS, stock markets index	VAR and others	There is a negative and strong relationship between CDSs and stock prices in Greece.

Table 1. Continued

Asandului et al (2015)	Czech Republic, Hungary, Poland, and others	01.01.2005-30.04.2014	CDS, stock markets index	Johansen cointegration	Cointegration: Cointegrated Czech Republic, Hungary and Poland.
Apergis (2017)	Greece	02.01.2005-31.12.2015	CDS, stock markets	Granger causality test and others	Causality: CDS ⇒ Stock return
Shear et al. (2017)	Pakistan	12.10.2004-31.12.2012	CDS, KSE100	Granger causality test	Causality: KSE100 ⇒ CDS CDS ⇒ KSE100 (post crisis period)
Calice and Zeng (2021)	18 emerging markets and others	2007:12-2017:06.	CDS, exchange rate and others	Principal component analysis and others	In general, country CDSs affect the exchange rate in emerging markets.
Della Corte et al. (2021)	18 emerging markets and others	2003:01-2017:06	CDS, exchange rate	Panel data analysis and others	A strong bidirectional relationship was found between CDS and exchange rate. In addition, the increase in the CDS spread reduces the value of the local currency.

Note: ⇔; the existence of a bidirectional causality relationship and ⇒; shows the direction of causality. Emerging markets are based on Morgan Stanley Capital International's (MSCI) classification.

When Turkey-scale studies are examined, many studies found long-term relationships between CDS, BIST100 index, and USD/TRY exchange rate. However, the results of causality between the variables are different. It is estimated that the reason for this difference may be that each study focuses on different periods. When studies focusing on other emerging markets are examined, the relationship between CDS, stock market index, and the exchange rate has been determined in many studies. However, the direction and impact of these relations vary at the country level. Our study, unlike other studies, examines the relationships between CDS, stock market, and exchange rate during the Covid-19 period. The Covid-19 outbreak has seriously affected all financial markets and macroeconomic indicators. Another impact of the Covid-19 outbreak has been on country CDS spreads (Pan et al., 2021: 288; Liu et al., 2021: 1). Considering the serious effects of Covid-19 on country risk and financial markets, the determination of the effects of CDS spreads, especially on the fragile exchange rates and stock market indices of developing countries, will be very important for many decision-makers in macroeconomic policy, investment decisions and portfolio management. In addition, as another difference from other studies, the frequency domain causality test was used in our study. Unlike classical causality tests, this test provides information about short, medium, and long-term causality relationships. It is expected that this study will contribute to the literature by revealing the short, medium, and long-term relationships between CDS, BIST100 index, and USD/TRY exchange rate in the Covid-19 period.

3. Data and Methodology

In the study, daily closing data of the variables are used to investigate the relationships between CDS, BIST100 index, and USD/TRY exchange rate during the Covid-19 period. The study covers the period of 11.03.2020-03.03.2022. Since the date of the first appearance of the Covid-19 case in Turkey is 11.03.2020, it constitutes the initial period of the study (Sağlık Bakanlığı, 2022). All series were included in the analysis in the study by taking their natural logarithm. All series of the study were obtained from www.investing.com. The descriptive statistics of the variables are reported in the appendices.

3.1. Testing in the Frequency Domain

The causality test in the frequency domain developed by Breitung and Candelon (2006), unlike classical causality tests, provides information about the causality relationship in the short, medium, and long-term. Breitung and Candelon's (2006) test of causality in the frequency domain improves the frequency causality analysis brought to the literature by Geweke (1982) and Hosoya (1991) and utilizes the vector autoregressive (VAR) model established with two variables. However, Breitung and Candelon perform a Fourier transform to the classical VAR model. Geweke's (1982) and Hosoya's (1991) frequency causality analysis is expressed as in equation (1).

$$M_{y\to x}(\omega) = \log\left[\frac{2\pi f_x(\omega)}{|\Psi_{11}(e^{-i\omega})|^2}\right] = \log\left[1 + \frac{\left|\Psi_{12}(e^{-i\omega})\right|^2}{|\Psi_{11}(e^{-i\omega})|^2}\right] \quad (1)$$

According to equation (1), when $\left|\Psi_{12}\left(e^{-i\omega}\right)\right|$=0, it takes the value $M_{y\to x}(\omega)$=0. In this case, y will not be the Granger cause of x at ω frequency (Ciner, 2011: 500). Breitung and Candelon (2006) suggested a much simpler approach to test the null hypothesis of no causality. The null hypothesis is expressed as $M_{y\to x}(\omega)$=0, also defined as $M_{y\to x}(\omega)$=0 and $\Psi_{12}(L) = -\frac{g^{22}\Theta_{12}(L)}{|\Theta(L)|}$. Where g^{22} is the lower diagonal element of G^{-1}. $|\Theta(L)|$is the determinant of $\Theta(L)$. Thus, the hypothesis that y is not the Granger cause of x at frequency ω can be tested with equation (2).

$$\Theta_{12}\left|\left(e^{-i\omega}\right)\right| = \left|\sum_{k=1}^{p}\theta_{12,k}\cos(k\omega) - \sum_{k=1}^{p}\theta_{12,k}\sin(k\omega)i\right| = 0 \tag{2}$$

In equation (2), since θ_{12} represents the element of Θ_k (1,2), necessary and sufficient conditions when $\Theta_{12}\left|\left(e^{-i\omega}\right)\right| = 0$;

$$\sum_{j=1}^{p}\theta_{12,j}\cos(jw) = 0 \tag{3}$$

$$\sum_{j=1}^{p}\theta_{12,j}\sin(jw) = 0 \tag{4}$$

equation is as in (3) and (4). Expressing it as $\alpha_j = \theta_{11,j}$and $\beta_j = \theta_{12,j}$for the sake of simplicity, the VAR equation for x_t will be as in equation (5).

$$x_t = \alpha_1 x_{t-1} + \cdots + \alpha_p x_{t-p} + \beta_1 y_{t-1} + \cdots + \beta_p y_{t-p} + \varepsilon_{1t} \tag{5}$$

The hypothesis $M_{y\to x}(\omega) = 0$ is equivalent to the hypothesis $H_0 = R(\omega)\beta = 0$. Here $\beta = [\beta_1 \ldots \beta_p]$ and $R(\omega) = \begin{bmatrix}\cos(\omega) & \cos(2\omega) & \ldots & \cos(p\omega)\\ \sin(\omega) & \sin(2\omega) & \ldots & \sin(p\omega)\end{bmatrix}$. The F statistic for the $H_0 = R(\omega)\beta = 0$ hypothesis is approximately distributed as $F(2, T-2p)$ for $\omega\epsilon(0,\pi)$.

The time dimension represented by the frequency levels is calculated with the formula $T = \frac{2\pi}{\omega}$. In addition, the frequency range of 2.5-2.0 represents the short-term, the frequency range of 1.5-1.0 represents the middle period, and the frequency range of 0.1-0.5 represents the long-term (Iskenderoglu and Akdag, 2018: 566; Buberkoku, 2021:173). Similarly, Ciner (2011: 235) emphasizes in his study that the frequencies of 2.5, 1.5, and 0.5 represent the short, medium, and long periods, respectively, while the frequency of 0.1 represents permanent causality.

4. Empirical Findings

Before examining the relationships between the variables in the study, it is necessary to investigate the stationarity properties of the variables. The unit root test results for the variables are shown in Table 2.

Table 2. Unit Root Test Results

	ADF		PP	
	Sabit	**Sabit+Trend**	**Sabit**	**Sabit+Trend**
LnCDS	-1.8254	-1.7882	-1.8890	-1.8578
LnBIST100	-0.5144	-1.9654	-0.6060	-2.1623
LnUSD/TRY	-0.0935	-1.6131	0.0840	-1.3909
ΔLnCDS	-20.8351***	-20.8313***	-20.8302***	-20.8257***
ΔLnBIST100	-12.9584***	-12.9420***	-22.6563***	-22.6288***
ΔLnUSD/TRY	-19.0987***	-19.1164***	-18.9390***	-18.9581***

Note: The Δ notation represents the first difference of the series.

As seen in Table 2, all series with natural logarithms are non-stationary at the level but are stationary at the first difference. It is important to determine the stationarity of the series to apply a causality test in the frequency domain between the variables. After determining the stationarity of the series, Breitung and Candelon's (2006) causality analysis with appropriate delay can be started. In Table 3, the test results in the frequency domain of Breitung and Candelon (2006) are reported.

Table 3. Breitung Candelon Frequency Domain Causality Test Results

	Long-term		Medium-term		Short-term	
	0.1	0.5	1	1.5	2	2.5
CDS to BIST100	0.933	0.541	3.151	10.388***	11.573***	10.667***
BIST100 to CDS	22.830***	22.165***	21.169***	22.807***	13.977***	5.275*
CDS to USD/TRY	4.587	3.714	2.850	7.641**	8.288**	7.586**
USDT/TRY to CDS	21.339***	19.440***	11.276***	8.749**	5.792*	9.431***

Note: Since our study consists of daily data, the short-term corresponds to about 2-3 days, the medium-term to about 4-6 days, and the long-term to about 13-62 days. The appropriate lag length was chosen according to the Akaike information criterion.

As seen in Table 3, the null hypothesis that there is no causal relationship in the medium and short run was rejected. Therefore, there is a causality relationship between CDS and the BIST100 index in the short and medium-term. The causality relationship from BIST100 index to CDS was realized in all short, medium and long periods. These results support the studies of Esen et al. (2015), Celik and Koc (2016), Degirmenci and Pabuccu (2016), Sahin and Ozkan (2018), Bildirici et al. (2019) and Iltas and Guzel (2021), who found bidirectional causality between CDS and the BIST100 index. The causality from CDS to USD/TRY rate was determined in the short and medium-term. The causality relationship from USD/ TRY rate to CDS was realized in all of the short, medium and long periods. The result of bidirectional causality determined between CDS and USD/TRY exchange rate in our study contradicts the studies of Conkar and Vergili (2017), Ozpınar et al. (2018). This difference may be due to the focus of our study on the Covid-19 period. Finally, graphs showing the causality results between variables at all frequencies are available in the appendix.

5. Conclusion

The Covid-19 outbreak severely affected all financial markets and macroeconomic indicators. In addition, the Covid-19 outbreak increased countries' risk premiums and default risk and affected CDS spreads (Pan et al., 2021: 288). At the same time, CDS spreads are closely related to the country's political, economic, and social developments. Changes in CDS spreads will affect investor expectations and will also affect the stock market. At the same time, the increase in CDS spreads is expected to cause international investors to exit the stock markets and cause liquidity problems in the markets (Arzova et al., 2020: 26-27). Similarly, it is expected that there will be a reciprocal relationship between exchange rates and CDS spreads due to the foreign exchange-dependent structures of developing countries such as Turkey and the high current account deficit.

This study investigated the relationships between CDS, BIST100 index, and USD/TRY exchange rate during the Covid-19 period. In this context, the causality relationships between the variables were examined using the frequency domain causality test developed by Breitung and Candelon (2006). According to the results of the frequency domain causality test of the study, a bidirectional causal relationship was found between CDS and the BIST100 index during the Covid-19 period. Considering that CDS spreads affect the risk perception of national and international portfolio investors and invest accordingly, this result is not surprising. In addition, during the Covid-19 period, while the relationship between CDS and BIST100 occurred in the short and medium-term from CDS to BIST100 index, it was detected in all periods from BIST100 index to CDS. In other words, during the Covid-19 period, it can be stated that while the causality from CDS to BIST100 index is not permanent, causality from BIST100 index to CDS is permanent. Similarly, a bidirectional causality relationship was found between CDS and the USD/TRY exchange rate during the Covid-19 period. When this result is evaluated from an economic point of view, it is expected that the increase in USD/TRY exchange rate due to reasons such as Turkey's imports being predominantly in USD and the high current account deficit in Turkey will increase the external debt burden and increase the credit risk. Accordingly, CDS spreads are expected to increase. In the opposite case, CDS spreads are expected to decrease as the decrease in the USD/TRY exchange rate will reduce the country's external debt burden and credit risk. In summary, CDS spreads are expected to increase or decrease depending on positive or negative developments in the USD/TRY exchange rate. Likewise, since the increase in CDS spreads affects the risk perception of the investor, it will cause the foreign investor to leave the country and increase the USD/TRY exchange rate. In addition, during the Covid-19 period, while the relationship between CDS and USD/TRY exchange rate was realized in the short and medium-term from CDS to USD/TRY exchange rate, it was determined from USD/TRY to CDS in all periods. In other words, during the Covid-19 period, it can be stated that while the causality from CDS to USD/TRY exchange rate is not permanent, the causality from USD/TRY exchange rate to CDS is permanent.

The results of the study provide useful information for investors and policymakers. In this direction, a series of policies have been proposed to investors and policymakers. Firstly, investors are advised to make their investment decisions by considering CDS, valued daily, in the investment decisions they will make on the relevant assets, especially during periods of high uncertainty such as the Covid-19 period. Especially considering that CDS effectively predicts BIST100 and USD/TL exchange rates in the short and medium-term, it is recommended that short and medium-term investors follow CDS closely daily. In addition, considering that CDS

will not cause any change in BIST100 index returns and USD/TRY exchange rate in the long-term, it can be suggested that investors making long-term investments should not act sensitively to increases and decreases in CDS. Secondly, since the CDS spread affects the stock market performance, policymakers should develop policies to support the development of the stock markets and to control the CDS spread. At the same time, since the increase in the performance of the stock market is expected to decrease the CDS spreads, it is recommended that policymakers take steps to improve the stock market. Thirdly, changes in CDS spreads also affect investor perception. Appropriate policies should be made in order to keep CDS spreads at low levels, which may change investor perception. Fourthly, CDS affects BIST100 and USD/TRY exchange rate in the short and medium-term. This result shows that policymakers do not have long to take precautions against the possible negative effects of the increase in CDS spreads on the BIST100 index and USD/TRY exchange rates, and they should take action immediately. Finally, since it will be important for investors to investigate the determinants of CDS spreads in Turkey, especially during the Covid-19 period, it will be useful to investigate this issue in the future.

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
I am a single author of this paper. My contribution is 100%.

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

References

Acaravcı, S.K. ve Karaömer, M.Y. (2017). Borsa İstanbul (BİST-100) ve kredi temerrüt takası (CDS) arasındaki ilişkinin incelenmesi. R. Aydın ve H. Yıldız (Ed.), *Mediterranean international conference on social sciences* içinde (s. 260-273). First Mediterranean International Conference on Social Sciences'da sunulan bildiri. Sarajevo: Dobra Knjiga.

Anagnostou, I., Squartini, T., Kandhai, D. and Garlaschelli, D. (2021). Uncovering the mesoscale structure of the credit default swap market to improve portfolio risk modelling. *Quantitative Finance*, 21(9), 1501-1518. https://doi.org/10.1080/14697688.2021.1890807

Apergis, N. (2017). The role of sovereign CDS spreads for stock prices: Evidence from the Athens stock exchange over a "default" period. In C. Floros and I. Chatziantoniou (Eds.), *The Greek debt crisis* (pp. 153-175). London: MacMillan.

Apergis, N., Danuletiu, D. and Xu, B. (2022). CDS spreads and COVID-19 pandemic. *Journal of International Financial Markets, Institutions and Money*, 76, 101433. https://doi.org/10.1016/j.intfin.2021.101433.

Arzova, S.B., Atakişi, A. ve Ekmekçi, U. (2020). *Endekslerle Türkiye ekonomisi*. İstanbul: Remzi Kitabevi.

Asandului, M., Lupu, D., Mursa, G.C. and Muşetescu, R. (2015). Dynamic relations between CDS and stock markets in Eastern European countries. *Economic Computation and Economic Cybernetics Studies and Research*, 4, 151-170. Retrieved from https://mpra.ub.uni-muenchen.de/

Avcı, B.Ö. (2020). Interaction between CDS premiums and stock markets: Case of Turkey. *Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 13(1), 1-8. https://doi.org/10.25287/ohuiibf.526638

Bayhan, S., Kömür, S. ve Yıldız, Ü. (2021). Türkiye için döviz kuru ve CDS primleri arasındaki ilişkinin frekans alanı nedensellik analizi. *Uluslararası Ekonomi İşletme ve Politika Dergisi*, 5(2), 329-339. https://doi.org/10.29216/ueip.1008180

Bildirici, M., Sonüstün, B. and Gökmenoğlu, S.M. (2019). CDS-stock market chaotic relationship-Turkish stock market case. *AIP Conference Proceedings*, 2178(1), 030068. https://doi.org/10.1063/1.5135466

Bolak, M. (2016). *Risk yönetimi*. İstanbul: Birsen Yayınevi.

Breitung, J. and Candelon, B. (2006). Testing for short and long run causality: A frequency domain approach. *Journal of Econometrics*, 132(2), 363-378. https://doi.org/10.1016/j.jeconom.2005.02.004

Büberkökü, Ö. (2021). Kripto para birimleri arasındaki frekans alanlı nedensellik ilişkinin analizi. *İşletme Bilimi Dergisi*, 9(2), 165-192. https://doi.org/10.22139/jobs.955795

Calice, G. and Zeng, M. (2021). The term structure of sovereign credit default swap and the cross-section of exchange rate predictability. *International Journal of Finance & Economics*, 26(1), 445-458. https://doi.org/10.1002/ijfe.1798

Chan, K.C., Fung, H. and Zhang, G. (2009). On the relationship between Asian credit default swap and equity markets. *Journal of Asia Business Studies*, 4(1), 3-12. https://doi.org/10.1108/15587890980000414

Choudhry, M. (2006). *The credit default swap basis*. New York: Bloomberg Press.

Ciner, C. (2011). Commodity prices and inflation: Testing in the frequency domain. *Research in International Business and Finance*, 25(3), 229-237. https://doi.org/10.1016/j.ribaf.2011.02.001

Coronado, M., Corzo, M.T. and Lazcano, L. (2012). A case for Europe: The relationship between sovereign CDS and stock indexes. *Frontiers in Finance and Economics*, 9(2), 32-63. https://doi.org/10.2139/ssrn.1889121

Çelik, S. and Koç, Y.D. (2016). Relationship between sovereign credit default swap and stock markets: The case of Turkey. *The Macrotheme Review*, 5(4), 36-40. Retrieved from https://macrotheme.com/

Çonkar, M.K. ve Vergili, G. (2017). Kredi temerrüt swapları ile döviz kurları arasındaki ilişki: Türkiye için ampirik bir analiz. *Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 10(4), 59-66. https://doi.org/10.25287/ohuiibf.310704

Değirmenci, N. ve Pabuçcu, H. (2016). Borsa İstanbul ve risk primi arasındaki etkileşim: VAR ve NARX model. *Akademik Sosyal Araştırmalar Dergisi*, 4(35), 248-261. Erişim adresi: https://asosjournal.com/

Della Corte, P., Sarno, L., Schmeling, M. and Wagner, C. (2021). Exchange rates and sovereign risk. *Management Science*, 1-121. https://doi.org/10.1287/mnsc.2021.4115

Eren, M. ve Başar, S. (2016). Makroekonomik faktörler ve kredi temerrüt takaslarının BIST-100 endeksi üzerindeki etkisi: ARDL yaklaşımı. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 30(3), 567-589. Erişim adresi: https://dergipark.org.tr/en/pub/atauniiibd

Esen, S., Zeren, F. and Şimdi, H. (2015). CDS and stock market: Panel evidence under cross-section dependency. *South-Eastern Europe Journal of Economics*, 13(1), 31-46. Retrieved from https://ojs.lib.uom.gr/

Evci, S. (2020). Kredi temerrüt swapları ile Borsa İstanbul arasındaki eşbütütünleşme ilişkisinin analizi. *Gaziantep Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 2(1), 100-117. Erişim adresi: https://dergipark.org.tr/en/pub/gauniibf

Fu, X., Li, M.C. and Molyneux, P. (2021). Credit default swap spreads: Market conditions, firm performance, and the impact of the 2007–2009 financial crisis. *Empirical Economics*, 60(5), 2203-2225. https://doi.org/10.1007/s00181-020-01852-0

Geweke, J. (1982). Measurement of linear dependence and feedback between multiple time series. *Journal of the American Statistical Association*, 77(378), 304-324. Retrieved from https://www.jstor.org/

Gök, R. and Kara, E. (2021). Testing for causality among CDS, interest, and exchange rates: New evidence from the Granger coherence analysis. *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 16(2), 427-445. https://doi.org/10.17153/oguiibf.854172

Hosoya, Y. (1991). The decomposition and measurement of the interdependence between second-order stationary processes. *Probability Theory and Related Fields*, 88, 429-444. https://doi.org/10.1007/BF01192551

Hull, J.C. (2008). *Options futures and other derivatives* (9th Edition). New Jersey: Pearson Education.

İltaş, Y. ve Güzel, F. (2021). Borsa endeksi ve belirsizlik göstergeleri arasındaki nedensellik ilişkisi: Türkiye örneği. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 39(3), 411-424. https://doi.org/10.17065/huniibf.821072

İskenderoğlu, Ö. ve Akdağ, S. (2018). VIX korku endeksi ile çeşitli ülkelerin hisse senedi endeks getirileri arasında bir nedensellik analizi. *2nd International Economic Research and Financial Markets Congress Book* içinde (s. 556-572). Ankara: Detay Yayıncılık.

Kębłowski, P. (2011). The behaviour of exchange rates in the Central European countries and credit default risk premiums. *Central European Journal of Economic Modelling and Econometrics*, 3(4), 221-237. Retrieved from https://journals.pan.pl/

Liu, Y., Qiu, B. and Wang, T. (2021). Debt rollover risk, credit default swap spread and stock returns: Evidence from the COVID-19 crisis. *Journal of Financial Stability*, 53, 100855. https://doi.org/10.1016/j.jfs.2021.100855

Longstaff, F.A., Pan, J., Pedersen, L.H. and Singleton, K.J. (2011). How sovereign is sovereign credit risk? *American Economic Journal: Macroeconomics*, 3(2), 75-103. https://doi.org/10.1257/mac.3.2.75

Özpınar, Ö., Özman, H. ve Osman, D. (2018). Kredi temerrüt takası (CDS) ve kur-faiz ilişkisi: Türkiye örneği. *Bankacılık ve Sermaye Piyasası Araştırmaları Dergisi*, *2*(4), 31-45. Erişim adresi: https://dergipark.org.tr/en/pub/bspad

Pan, W.-F., Wang, X., Wu, G. and Xu, W. (2021). The COVID-19 pandemic and sovereign credit risk. *China Finance Review International*, 11(3), 287-301. https://doi.org/10.1108/CFRI-01-2021-0010

Sadeghzadeh, K. (2019). Borsa endekslerinin ülke risklerine duyarlılığı: Seçilmiş ülkeler için bir panel veri analizi. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 33(2), 435-450. Erişim adresi: https://dergipark.org.tr/en/pub/atauniiibd

Sağlık Bakanlığı. (2022). *Covid-19 bilgilendirme platformu*. Erişim adresi: https://covid19.saglik.gov.tr/

Sarıgül, H. ve Şengelen, H.E. (2020). Ülke kredi temerrüt takas primleri ile hisse senedi fiyatları arasındaki ilişki: Borsa İstanbul'da banka hisse senetleri üzerine ampirik bir araştırma. *Muhasebe ve Finansman Dergisi*, (86), 205-222. https://doi.org/10.25095/mufad.710367

Sarıtaş, H., Kılıç, E. ve Nazlıoğlu, E.H. (2021). CDS primleri ve derecelendirme (raiting) notları ile BIST100 endeksi arasındaki ilişkinin incelenmesi: Türkiye örneği. *Maliye ve Finans Yazıları*, 116, 73-92. https://doi.org/10.33203/mfy.854876

Shear, F. and Butt, H.A. (2017). *An analysis of the relationship between sovereign credit default swaps and the stock market of Pakistan through handling outliers* (SSRN Working Paper No. 2964820). https://doi.org/: 10.20472/EFC.2017.008.010

Sovbetov, Y. and Saka, H. (2018). Does it take two to tango: Interaction between credit default swaps and national stock indices. *Journal of Economics and Financial Analysis*, 2(1), 129-149. http://doi.org/10.2139/ssrn.2989728

Şahin, E.E. ve Özkan, O. (2018). Kredi temerrüt takası, döviz kuru ve BIST100 endeksi ilişkisi. *Hitit Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 11(3), 1939-1945. https://doi.org/10.17218/hititsosbil.450178

Topaloğlu, E.E. ve Ege, İ. (2020). Kredi temerrüt swapları (CDS) ile Borsa İstanbul 100 Endeksi arasındaki ilişki: Kısa ve uzun dönemli zaman serisi analizleri. *İşletme Araştırmaları Dergisi*, 12(2), 1373-1393. https://doi.org/10.20491/isarder.2020.918

Ustaoglu, E. (2022). Safe-haven properties and portfolio applications of cryptocurrencies: Evidence from the emerging markets. *Finance Research Letters*, 102716, 1-13. https://doi.org/10.1016/j.frl.2022.102716

APPENDIX

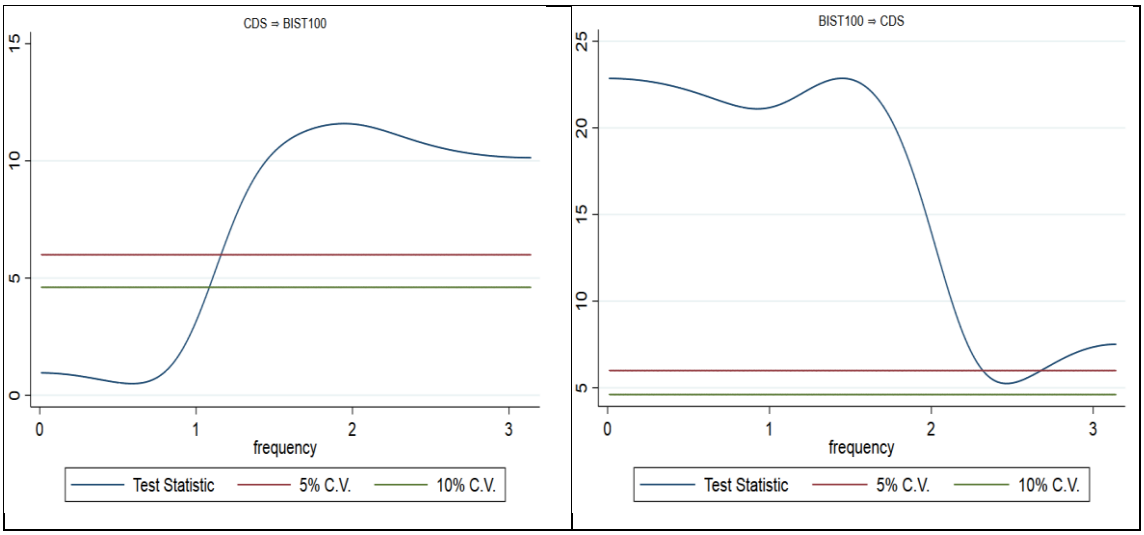

Figure A1. Causality results in the frequency domain between CDS-BIST100

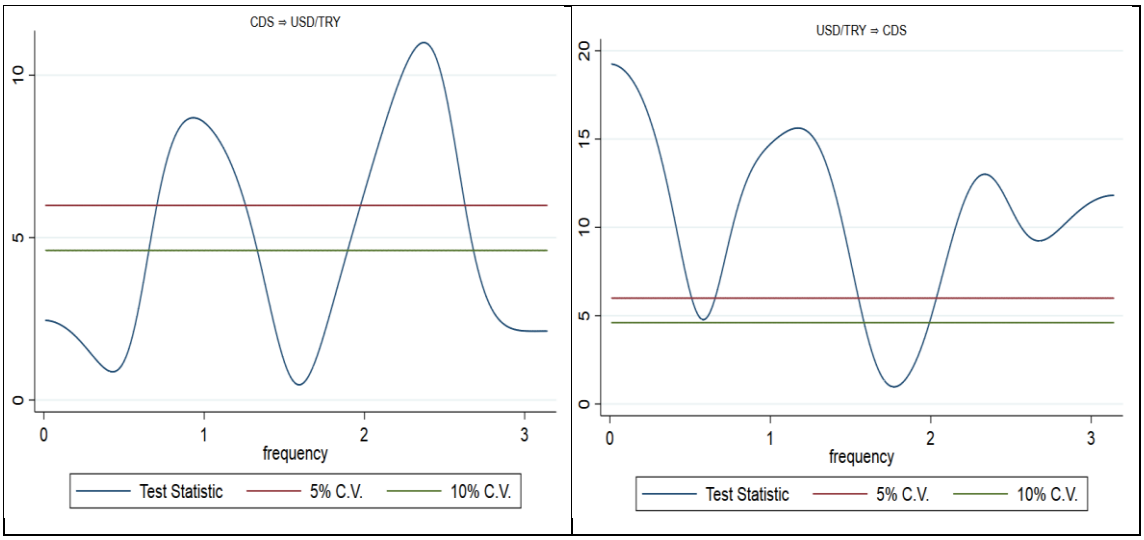

Figure A2. Causality results in the frequency domain between CDS-USD/TRY