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Time Series Analysis on Credit Default Swap (CDS) and Market Indicators: The Case of Türkiye

Kredi Temerrüt Takasi (CDS) ve Piyasa Göstergeleri Üzerine Zaman Serisi Analizi: Türkiye Örneği

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ABSTRACT

Regional and global cyclical fluctuations in the world economy reveal the importance of the CDS premium for developing countries such as Türkiye, which has fragile macroeconomic indicators and is highly dependent on international funds. This study deals with the influence of key economic indicators on CDS premiums with a focus on Türkiye in the period from January 2010 to March 2022, a period characterized by unconventional low-interest rate policies and economic crises, including the COVID-19 pandemic. By leveraging Türkiye's unique policy environment and crisis experiences, the study provides a natural experiment environment for understanding the mechanisms driving CDS premiums. Using recent and monthly data, the ARDL method has been employed to determine possible long- and short-run relationships among CDS premiums, and the exchange rate ($/TL), interest rates (applied to consumer loans in TL), Istanbul Stock Exchange 100 indexes, official reserves ($1,000,000), and total domestic credit volume ($). The Granger causality test further reveals the directional relationships among these variables. The general results provide strong evidence that exchange rate volatility and credit expansion contribute to increased CDS premiums, while official reserves and stock market performance help to mitigate country risk perceptions. The bidirectional Granger causality between CDS premiums and reserves further highlights the dynamic relationship between risk perceptions and policy responses. This paper provides new insights into the economic channels influencing country risk and highlights the critical role of financial stability policies in a developing country context.

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ÖZ

Dünya ekonomisindeki bölgesel ve küresel döngüsel dalgalanmalar, kırılgan makroekonomik göstergelere sahip ve uluslararası fonlara yüksek oranda bağımlı olan Türkiye gibi gelişmekte olan ülkeler için CDS priminin önemini ortaya koymaktadır. Bu çalışmada, Ocak 2010-

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Mart 2022 arasındaki dönemde Türkiye'ye odaklanılarak temel ekonomik göstergelerin CDS primleri üzerindeki etkisi incelenmektedir. Bu dönem, COVID-19 pandemisi de dahil olmak üzere, alışılmadık düşük faiz oranı politikaları ve ekonomik krizlerle karakterize olmuştur. Türkiye'nin kendine özgü politika ortamı ve kriz deneyimlerinden yararlanılarak, çalışma CDS primlerini yönlendiren mekanizmaları anlamak için doğal bir deney ortamı sunmaktadır. Güncel ve aylık veriler kullanılarak, CDS primleri ile döviz kuru ($/TL), faiz oranları (TL cinsinden tüketici kredilerine uygulanan), Borsa İstanbul 100 endeksi, resmi rezervler (1.000.000 $) ve toplam yurtiçi kredi hacmi ($) arasındaki olası uzun ve kısa vadeli ilişkiler ARDL yöntemi kullanılarak belirlenmiştir. Granger nedensellik testi ayrıca bu değişkenler arasındaki yönlü ilişkileri ortaya koymaktadır. Genel sonuçlar, döviz kuru oynaklığının ve kredi genişlemesinin CDS primlerinin artmasına katkıda bulunduğuna dair güçlü kanıtlar sunarken, resmi rezervler ve borsa performansı ülke risk algılarını azaltmaya yardımcı olmaktadır. CDS primleri ile rezervler arasındaki çift yönlü Granger nedenselliği, risk algıları ile politika tepkileri arasındaki dinamik ilişkiyi daha da aydınlatmaktadır. Bu makale, ülke riskini etkileyen ekonomik kanallara dair yeni bakış açıları sunarak ve gelişmekte olan bir ülke bağlamında finansal istikrar politikalarının kritik rolünü vurgulamaktadır.

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1. INTRODUCTION

The disappearance of economic borders through globalization has greatly increased the mobility of international capital. Following the 2008 mortgage crisis, the gradual decline in interest rates in developed countries made investments in developing economies, which offered higher interest rates but remained reliant on external financing, more attractive to global investors. As a result, large investments were made in these countries. International investors and fund managers require reliable indicators to mitigate risks, optimize investment decisions, and shield themselves from adverse market conditions during the decision-making process (Sarıtaş et al., 2021, p.74). Analyzing a country's economic data objectively and independently provides significant advantages for investors in making informed and accurate decisions. Until the 2008 crisis, the ratings of well-known agencies such as Moody's, S&P, and Fitch were the most widely used methods of measuring credit risk. However, the bankruptcy of Lehman Brothers, which had the highest credit rating in the 2008 crisis, undermined confidence in credit rating agencies and exposed their limitations in risk prediction. For this reason, the credit default swap (CDS) developed by J.P. Morgan has started to be considered as an alternative in the process of risk assessment by international investors (Özçelik and Göksu, 2020, p.70).

A CDS is essentially a bilateral contract on the creditworthiness of a reference entity in which the protection seller promises to pay the protection buyer's losses if the issuer of the underlying bond defaults before the CDS matures. In return, the protection buyer promises to pay the protection seller. In this sense, CDSs are financial derivatives that provide "insurance" against the creditworthiness of a referenced entity, such as a government or a corporation (Sazak, 2012, p.4). The increase in the CDS premium, which is one of the main determinants of foreign investors' perception of risk, means that the risk of the country or company in question increases for the investor; a lower CDS premium means lower risk and higher credibility. In other words, the higher the risk of default, the higher the premium to be paid. For example, if the CDS on country A is 200 basis points, you would have to pay 2% of the face value of your receivables each year as a CDS premium to insure them. If the CDS on a country such as Country B were 600 basis points instead of 200, the insurance cost would be 6% of the face value each year. Therefore, it can be said that the risk of default or bankruptcy in Country A is much lower than in Country B (Danacı et al., 2017). The main advantage of CDS over other measures of credit risk is that premiums are adjusted very regularly, on a daily basis, to reflect current market conditions. Any new situation in the market is very quickly reflected in CDS premiums, as spreads are revised daily to reflect supply and demand for the relevant CDS contract (Hull, 2008).

Regional and global cyclical fluctuations in the world economy, especially in the recent past, reveal the importance of the CDS premium for developing countries such as Türkiye, which has fragile macroeconomic indicators and is dependent on international funds. To contribute to the literature on a developing country, this study examines the impact of various financial and economic variables on CDS and attempts to examine the potential dimensions of the relationship between these determinants. Unlike previous studies, this research focuses on Türkiye's unconventional monetary policy environment, featuring low interest rates policy despite economic crises and volatility. This provides a "natural experiment" setting for understanding risk dynamics in a fragile emerging market. Moreover, as discussed in the succeeding sections, our study differs from the existing literature by employing both the ARDL

cointegration approach and Granger causality analysis to obtain robust results. In addition, the use of diverse combinations of financial and economic variables enhances the comprehensiveness and reliability of the findings. For this purpose, data on 5-year CDS premium, exchange rate ($/TL), interest rate, Istanbul Stock Exchange 100 index, official reserves ($1,000,000), and total domestic credit volume ($) have been used. The study employs the ARDL cointegration approach to analyze short- and long-term relationships, while the Granger causality test identifies the causal directions among the variables.

The subsequent parts of the study are as follows. The second section summarizes the studies in the literature. The third section defines the dataset used in the analysis, explains the stages of the empirical analysis, and interprets the results. Finally, the fourth section draws conclusions based on the empirical findings.

2. LITERATURE REVIEW

This section briefly discusses studies that examine the relationship between the CDS premium and economic and financial factors. Yang et al. (2010) examine the relationship between the CDS premium, the risk-free rate, and the exchange rate using VAR and Granger causality tests on data for the US and France over the period 2005-2009. Their results suggest unidirectional causality between the CDS premium and the exchange rate for France. For the US, they find multidirectional Granger causality. Moreover, the CDS premium and the exchange rate are negatively correlated for France, while they are positively correlated for the United States. Brandorf and Holmberg (2010) aim to determine the impact of inflation, unemployment, and growth rates on CDS premiums for Italy, Spain, Ireland, Portugal, and Greece over the period 2004-2009. According to the results, inflation and unemployment have an increasing impact on CDS premiums.

Dieckmann and Plank (2012) examine the sovereign CDS spreads of 18 countries between 2007 and 2010, focusing on the role of European Economic and Monetary Union (EMU) membership. Their findings suggest that while EMU members tend to have lower CDS spreads on average, they are more sensitive to global and local financial shocks than non-EMU members. In particular, EMU countries are twice as sensitive to global financial shocks, probably due to their inability to control monetary policy individually under the common euro currency. The study by Chodnicka-Jaworska and Jaworski (2017) identifies key factors influencing bank CDS spreads using quarterly data for European and American banks from 2004 to 2015, using static panel models. The result reveals that market risk factors are the most important drivers of CDS spreads, while capital adequacy, earnings potential, and liquidity have weaker effects. The study emphasizes that earnings potential and economic uncertainty play a significant role in determining credit risk. Blommestein et al. (2016) analyze 5 European countries. The study finds that macroeconomic factors are the main drivers of sovereign CDS spread changes. Economic and financial indicators have a limited impact, with the exception of Italy. Moreover, changes in sovereign credit risk are significantly influenced by domestic economic and financial conditions. Eyssell et al. (2013) examine sovereign CDS spreads in China from 2001 to 2010 and find that both country-specific factors (e.g., Chinese stock market index, real interest rate) and global variables (e.g., US stock volatility, global market developments) influence CDS spread changes. The relevance of domestic factors was stronger in earlier years, while changes in CDS spreads were found to lead to stock market returns. Sand (2012) investigates the relationship between the CDS premium and the current account deficit, the risk-free interest rate, the debt-to-GDP ratio, and inflation, using data for 16-euro area countries over the period 2007–2011. The study finds that the CDS premium increases with inflation and the debt-to-GDP ratio. Fung et al. (2008) investigated the possible relationship between US stock prices and CDS premiums over the period 2001-2007. The results of the study show that the CDS premium dominates US stock prices. Haspolat (2019) has worked on 68 countries in the period 2004-2007 using the panel data method and finds that exchange rate and inflation have an impact on CDS premiums, but political stability has no impact on CDS premiums.

Ho (2014) examines the relationship between the CDS premium, external debt levels, and national reserves for Brazil, Malaysia, Türkiye, Thailand, South Korea, South Africa, Mexico, and Indonesia during the period 2008–2013. The result shows that there is a co-integration between the CDS premium the amount of external debt and the number of reserves. Akyol et al. (2019) analyzed the case of Türkiye using an ARDL model for the period 2005–2008. The results show that the interest rate, exchange rate, and inflation rate have an impact on CDS, but economic growth has no impact on CDS. Kılcı (2017) tested 5-year CDS premiums, growth, inflation, and unemployment rates, the share of current account deficit in national income, exchange rate, banks' capital adequacy ratio, and BIST 30 variables for the period 2010-2016. The results suggest that the change in Türkiye's CDS premiums is mainly driven by the performance of the banking sector. Furthermore, the findings reveal a robust and persistent relationship over the long term between the real effective exchange rate and CDS premiums. Sarıtaş et al. (2021) analyze the effects of the BIST100 index and credit ratings on CDS premiums for Türkiye during the period 2010–2020. They use the ARDL model for the estimation process. The results indicate a statistically significant negative relationship between CDS premiums and credit rating and BIST100. İskenderoğlu and Balat (2018) try to find the answer to the question of whether credit ratings affect CDS premiums in BRICS countries and Türkiye, using data from 2013-2018. They

find that both lowering and raising credit ratings increase CDS premiums.

Moreover, the previous literature reveals that various studies have investigated the impact of economic and financial indicators on CDS premiums in Türkiye, employing diverse methodologies. Bolaman Avcı (2020) applies the Toda-Yamamoto causality test and finds a unidirectional causality running from the BIST100 index to CDS premiums, while Şahin and Özkan (2018) use the Granger causality test and identifies a bidirectional Granger causality between CDS premiums and the stock market index. Similarly, Bektur and Malcıoğlu (2017) utilize the Hacker and Hatemi-J causality test and demonstrate a unidirectional causality from CDS premiums to the BIST100 index. On the other hand, Sovbetov and Saka (2018) employ the ARDL method and reveal a long- and short-term negative relationship between CDS premiums and the stock market index, along with bidirectional causality. Regarding exchange rates, Çonkar and Vergili (2017) use the Granger causality test and report a unidirectional causality from the exchange rates to CDS premiums. Additionally, Ekrem et al. (2018) have conducted an ARDL analysis on the fragile Five economies and have found that macroeconomic indicators such as growth, public debt, and current account balance explain the CDS premiums in the long run, whereas short-run effects are not statistically significant. Buz and Küçükkocaoğlu (2023) examine the short- and long-term effects of economic and social crises, credit rating scores, and specific macroeconomic factors on CDS premiums in Türkiye using the ARDL approach with monthly data spanning from 2005 to November 2020. Their results indicated that, in the long run, the stock market index and growth rate have a negative effect on CDS premiums, while the exchange rate has a positive effect. In the short run, the stock market index showed a negative effect, whereas the exchange rate, benchmark interest rates, and crises had a positive impact on CDS premiums. Finally, Özçelik and Göksu (2020) examine the causality relationships and long-term dynamics between variables in Türkiye for the 2010-2019 period using both ARDL analysis and Granger causality test, similar to our study. Their results reveal that changes in inflation and credit risk premiums are the Granger causes of interest rate changes. Moreover, CDS premiums are found to influence inflation, with a causality relationship between the two. However, this study only utilizes CDS premiums, interest rates, and inflation variables, and its sample period excludes the pandemic period and the era of unconventional low-interest rate policies, which makes our study unique.

While these studies primarily focus on either long-term relationship through ARDL or causality tests individually, they often fail to integrate both methods to ensure the robustness of results. In this regard, the present study distinguishes itself by employing both the ARDL method and Granger causality analysis to provide a comprehensive understanding of the long- and short-term determinants of CDS premiums in Türkiye. By focusing on a period characterized by unconventional low-interest rate policies, economic crises, and the pandemic, this study offers unique insights into the mechanism driving CDS premiums within a natural experiment environment.

3. RESULTS AND METHOD

Table 1 presents the variables examined in the estimation process. 5-year credit default swap (CDS) premium has been used as the dependent variable. Several control variables that are likely to be correlated with CDS premiums are also included such as exchange rates ($/TL), interest rates, Istanbul Stock Exchange 100 indexes (BIST100), official reserves ($1,000,000), and total domestic credit ($) as control variables. The control series have been transformed into logarithmic form.

Table 2 depicts the descriptive statistics of all the determinants used. The table shows that the interest rate varies considerably over time. The minimum rate is 9.2%, while the maximum rate over the period is around 38%. Similarly,

Table 1. Variables

Variables	
LCDS	Credit default premium (5 years)
Lint	Interest rates that applied to consumer loans in TL
LEXC	Exchange rate ($/TL)
LBIST100	Istanbul stock exchange market 100 indexes
LRES	Official reserve assets (1.000.000 $)
LCRED	Total domestic credit volume ($)

Table 2. Descriptive statistics

	CDS	INT	EXC	BIST100	RES (1.000.000 $)	CRED ($)
Mean	273.3	17.0	3.93	908.9	106.259	433.434.113
Maximum	582.2	37.8	14.56	2233.3	134.576	549.961.619
Minimum	119.6	9.2	1.41	497.1	71.859	228.818.556
Stn. Dev	119.1	5.3	2.74	311.7	16.513	75.927.658
Observation	147	147	147	147	147	147

Table 3. Correlation matrix

	CDS	INT	EXC	BIST100	RES	CRED
CDS	1.000					
INT	-0.022	1.000				
EXC	0.375	0.097	1.000			
BIST100	-0.5967	0.037	-0.134	1.000		
RES	-0.353	-0.172	-0.534	0.242	1.000	
CRED	-0.133	-0.152	-0.672	0.085	0.456	1.000

Figure 1. Trend of variables

the CDS premiums exhibit significant variation over the period. The minimum CDS is 119.6, while the maximum reaches 582.2. On average, the risk premium has increased by about five times over the period. The exchange rate also demonstrates an upward trend over the period. The exchange rate has increased by a factor of approximately 10.3 over the period.

Table 3 presents the correlation matrix to provide an initial look at the relationship between CDS and other determinants. As anticipated, the interest rate, stock market indexes, and official reserves are negatively correlated with CDS premiums. Similarly, as expected, the exchange rate is positively correlated with CDS premiums. Furthermore, the table also shows that there is no problem of multicollinearity among the determinants.

Figure 1 illustrates the trends of the variables over the years. Notably, the CDS premium, exchange rate, stock market index, and interest rate exhibit a sharp increase after 2018, which attracts considerable attention. Conversely, official reserves and credit volume experience a sharp decline during the same period. At the beginning of 2020, the upward trend in CDS premiums, exchange rate, interest rate, and stock market index accelerated, probably because of the pandemic. However, credit volume shows a sharp decline after 2020.

In addition to being suitable for models with a limited number of observations, the ARDL method allows for the analysis of variables that do not need to be stationary in the same order. This method can be used without unit root testing, but if the variables are stationary in the second difference I (2), the ARDL method cannot be performed due to the lack of appropriate critical values. To prove that the variables are stationary at the first level, we run the ADF and PP unit root tests. The null hypothesis is that the variable has a unit root in the Augmented Dickey-Fuller and Phillips-Perron tests. According to the results in Table 4, we reject the null hypothesis of a unit root at all levels of significance for all determinants at the first level I (1).

Table 5 presents the long-run cointegration results of the determinants. The F-bound statistic, obtained using the ARDL method, confirms statistically significant results. In this model, the F-bound (54.8155) exceeds the upper critical limits at all levels of significance (1%, 5% and 10%). The results indicate that CDS premiums are cointegrated with the independent variables.

Specifically, the results show that Lexc (exchange rate), LBIST100 (stock market index), Lres (official reserves) and Lcred (credit volume) significantly affect CDS premiums. These results suggest that the exchange rate and credit volume have a positive impact on CDS premiums in the long run. Conversely, official reserves and the stock market index have a negative impact on CDS premiums. In quantitative terms, a 1% increase in the exchange rate leads to an increase in CDS premiums of 2.39%, while a 1% increase in the stock market index reduces CDS premiums by 1.25%. However, the interest rate has no significant impact on CDS premiums.

$$\begin{aligned} \boldsymbol{lnCDS} = {} & \boldsymbol{\beta_0} + \boldsymbol{\beta_1} \textstyle\sum_{i=1}^{k} \Delta \boldsymbol{lnint}_{t-i} + \boldsymbol{\beta_2} \textstyle\sum_{i=1}^{l} \Delta \boldsymbol{lnexc}_{t-i} \\ & + \boldsymbol{\beta_3} \textstyle\sum_{i=1}^{m} \Delta \boldsymbol{lnbist100}_{t-i} + \boldsymbol{\beta_4} \textstyle\sum_{i=1}^{n} \Delta \boldsymbol{lnres}_{t-i} \\ & + \boldsymbol{\beta_5} \textstyle\sum_{i=1}^{p} \Delta \boldsymbol{lncred}_{t-i} + \boldsymbol{\beta_6} \Delta \boldsymbol{lnint}_{t-1} + \boldsymbol{\beta_7} \Delta \boldsymbol{lnexc}_{t-1} \\ & + \boldsymbol{\beta_8} \Delta \boldsymbol{lbist100}_{t-1} + \boldsymbol{\beta_9} \Delta \boldsymbol{lnres}_{t-1} + \boldsymbol{\beta_{10}} \Delta \boldsymbol{lncred}_{t-1} + \varepsilon_i \end{aligned}$$

It has been concluded that short-term dynamics are associated with long-term relationships, as indicated by the value and sign of the lagged error correction term (ECT), coefficient Δ[Coint Eq (− 1)]. As expected, ECT has a negative coefficient at 1% level. This reveals that there exists an involvement between the dependent variable and the independent variable in the long run. The ECT coefficient

Table 4. Unit root tests

	Variables	Phillips-Perron		ADF	
		Intercept	Intercept &Trend	Intercept	Intercept &Trend
I(0)	Lcds	-1.4073 (0.5773)	-3.5048 (0.050)*	-1.5011 (0.5305)	-3.3778 (0.0583)*
	Lint	-1.8118 (0.3704)	-2.8059 (0.1976)	-1.4803 (0.5409)	-3.4543 (0.0483)**
	Lexc	2.4359 (1.000)	-0.5981 (0.9775)	2.1190 (0.9998)	-0.8089 (0.9617)
	LBIST100	1.1379 (0.9977)	-1.7975 (0.7012)	0.3544 (0.9803)	-1.6897 (0.7511)
	Lres	-2.3332 (0.1632)	-2.2616 (0.4517)	-2.3362 (0.1632)	-2.2617 (0.4517)
	Lcred	-3.2125 (0.0212)**	-1.8768 (0.6614)	-3.2210 (0.0207)**	-1.8963 (0.6513)
I(1)	DLCDS	-64.2233 (0.0001)***	-64.1107 (0.0001)***	-11.3058 (0.0000)***	-11.2650 (0.0000)***
	DLINT	-73.4930 (0.0001)***	-73.1987 (0.0001)***	-9.0654 (0.0000)***	-9.0324 (0.0000)***
	DLEXC	-7.8055 (0.000)***	-7.9689 (0.000)***	-8.5462 (0.000)***	-8.9942 (0.000)***
	DLBIST100	-12.6340 (0.0000)***	-12.8576 (0.0000)***	-12.5003 (0.0000)***	-12.5408 (0.0000)***
	DLRES	-10.9913 (0.0000)***	-11.1110 (0.0000)***	-10.9715 (0.0000)***	-11.0516 (0.0000)***
	DLCRED	-9.3778 (0.0000)***	-9.9175 (0.0000)***	-9.4537 (0.0000)***	-10.0771 (0.0000)***

(*, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively)

Table 5. ARDL long run form and bounds test (unrestricted intercept and no trend)

F-bound test	**54.8155**			
Significance level	**Critical values**			
	Lower bound		**Upper bound**	
%1	3.41		4.68	
%5	2.62		3.79	
%10	2.26		3.35	
Variables	**Coefficients**	**Std. error**	**t-Statistic**	**Prob.**
Lint	-0.043	0.0622	-0.6986	0.4860
Lexc	2.392	0.2942	8.1301	0.0000***
LBIST100	-1.252	0.1299	-9.6381	0.0000***
Lres	-0.417	0.2036	-2.0476	0.0426**
Lcred	1.624	0.3619	-2.0476	0.0000***
C	0.0312	0.0104	-2.9980	0.0032***

(*, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively)

Table 6. ARDL error correction regression (unrestricted intercept and no trend)

Variables	**Coefficients**	**Std. error**	**t-Statistic**	**Prob.**
C	3.321	0.6961	4.770	0.0000***
DLCDS(-1)	-0.261	0.0722	-0.3652	0.0004***
DLEXC	3.4899	0.3607	9.6730	0.0000***
DLBIST100	-1.2435	0.1067	-11.6480	0.0000***
DLBIST100(-1)	-0.4692	0.1359	-3.4733	0.0007***
DLRES	-0.2477	0.2027	-1.2236	0.2233
DLRES(-1)	-0.3990	0.1970	-2.0247	0.0445**
DLCRED	2.9632	0.4265	6.9471	0.0000***
DLCRED(-1)	0.3412	0.2338	1.4592	0.1465
CoinEq(-1)*	-0.2399	0.0498	-4.8150	0.0000***

(*, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively)

is estimated at -0.24, implying that about 24% of the short-term imbalance is corrected each month, moving the system towards long-run equilibrium.

This model is a good fit and has passed all the diagnostic tests. The R-squared is 0.7199 (Adj. R-squared: 0.7012), which means that almost 72% of the variation in the dependent variable is explained by the model and the rest by the error term. The DW statistic is 2.1090, which confirms that there is no autocorrelation in the model. As shown in Table 7, the model passes the test for serial correlation, normality, and heteroskedasticity. The Ramsey Reset test is also applied to check that the model is properly constructed. The model also passes this test with a probability of 0.3580.

To confirm the robustness of the results, a structural stability test was also carried out. An illustration of the CUSUM (Cumulative Sum) and CUSUMSQ (Cumulative Sum of Squares) statistics is given in Figure 2 below. The CUSUM and CUSUMSQ figures remain within the 5% critical limit,

Table 7. Diagnostic tests

	Statistics	**Probability**
R-squared	0.7199	
Adj. R-squared	0.7012	
Durbin-Watson	2.1090	
F-Statistic	38.5517	0.0000
Breusch-Pagan Godfrey	0.8953	0.5655
LM Test	1.0871	0.3403
Ramsey Reset	0.9225	0.3580
Jarque-Bera	1.1366	0.5664

indicating parameter constancy and model stability. Both figures denote that none of the lines intersect by CUSUM and CUSUMSQ, that is, both CUSUM and CUSUMSQ plots are within the limits. Accordingly, this statistic confirms that

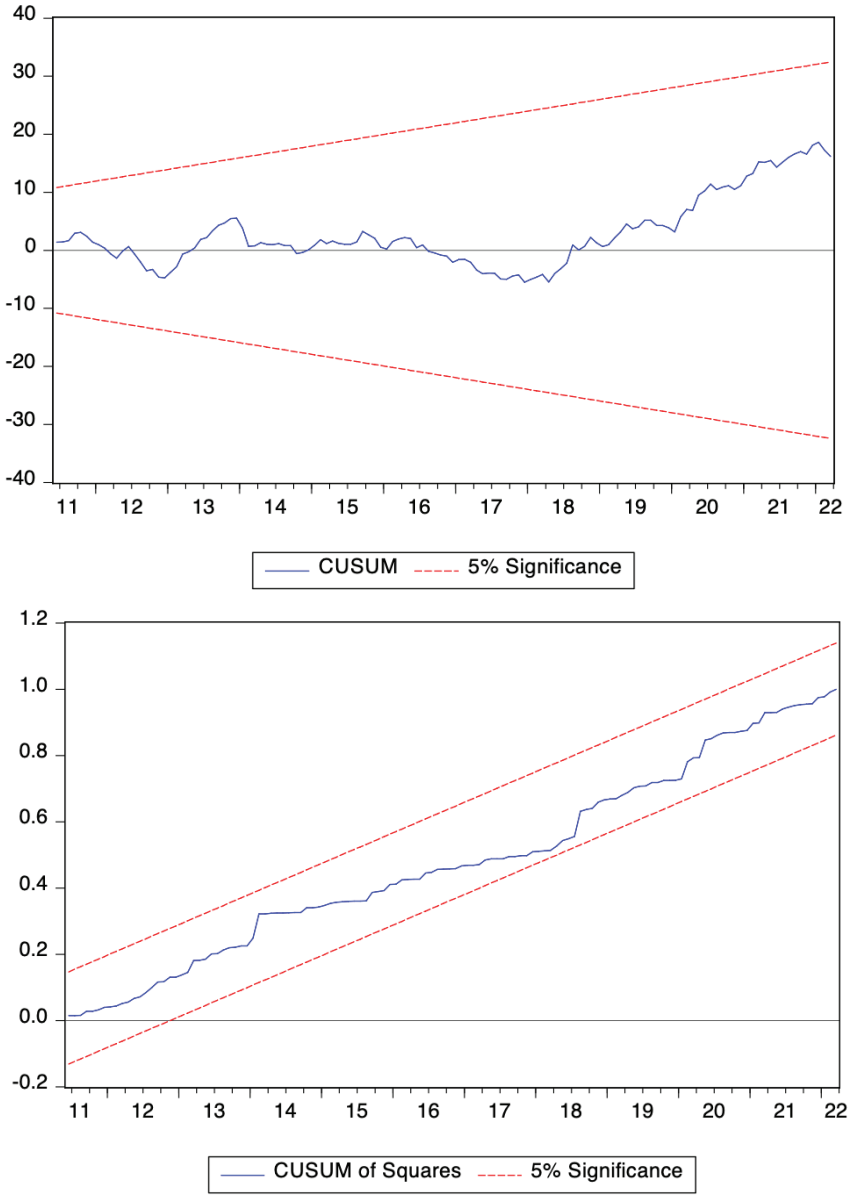

Figure 2. CUSUM (cumulative sum) and CUSUMSQ (cumulative sum of squares) tests**.**

there is no systematic change in the coefficients over the study period at the 5% significance level.

After the examination of the long run relationship between the determinants, the Granger causality test has been applied to specify the causality between the determinants. Unidirectional or bidirectional causality can also be expected between the series when cointegration is found among the determinants. For this purpose, the causal relationships between CDS premium, interest rate, exchange rate, stock market index, official reserves, and credit volume have been examined. The results indicate that the interest rate, the stock market index, the level of reserves and the volume of credit are Granger causes of CDS premiums.

Table 8. Granger causality tests (dependent variable: CDS premium)

Dependent Variable Lcds			
Excluded	**Chi-Sq**	**df**	**Prob**
Lint	6.2327	3	0.1008*
Lexc	1.9788	3	0.5768
LBIST100	12.5048	3	0.005***
Lres	7.0123	3	0.0715*
Lcred	6.1062	3	0.1066*
All	37.2576	15	0.0012***

Table 9. Granger causality tests (dependent variable: Interest rate)

Dependent variable lint			
Excluded	**Chi-Sq**	**df**	**Prob**
Lcds	4.2161	3	0.2390
Lexc	5.1577	3	0.1606
LBIST100	5.0064	3	0.1713
Lres	10.041	3	0.0182**
Lcred	18.080	3	0.0004***
All	61.5532	15	0.000***

Table 10. Granger causality tests (dependent variable: Exchange rate)

Dependent variable Lexc			
Excluded	**Chi-Sq**	**df**	**Prob**
Lcds	1.7542	3	0.6249
Lint	7.7926	3	0.0505**
LBIST100	1.8394	3	0.6064
Lres	3.4347	3	0.3293
Lcred	40.0052	3	0.000***
All	89.4514	15	0.000***

Table 11. Granger causality tests (dependent variable: BIST100)

Dependent variable LBIST100			
Excluded	**Chi-Sq**	**df**	**Prob**
Lcds	3.6994	3	0.2958
Lint	5.2289	3	0.1558
Lexc	8.5900	3	0.0353
Lres	9.8651	3	0.0197**
Lcred	5.3264	3	0.1494
All	34.9605	15	0.0126**

Table 12. Granger causality tests (dependent variable: Official reserve)

Dependent variable Lres			
Excluded	**Chi-Sq**	**df**	**Prob**
Lcds	8.8807	3	0.0309**
Lint	0.9916	3	0.8033
Lexc	10.6109	3	0.0140**
LBIST100	16.8943	3	0.0007***
Lcred	7.7284	3	0.0520**
All	6.2323	8	0.000***

Table 13. Granger causality tests (dependent variable: Credit volume)

Dependent variable Lcred			
Excluded	**Chi-Sq**	**df**	**Prob**
Lcds	2.0886	3	0.5542
Lint	29.5442	3	0.000***
Lexc	87.8708	3	0.000***
LBIST100	0.3794	3	0.9448
Lres	3.7615	3	0.2884
All	185.8996	15	0.000***

However, the exchange rate is not a Granger cause of CDS premiums.

Table 9 shows the result of the model using the interest rate as the dependent variable. The results show that official reserve and credit volumes are the Granger causes of interest rates. On the other hand, there is no bidirectional cause between CDS premiums and interest rates.

The results in Table 10 show that interest rate and credit volume are the Granger causes of exchange rates, while there is no Granger causality between CDS premiums, stock market index, reserve level and exchange rate. Moreover, there is no bidirectional causality between CDS premiums and the exchange rate.

The results in Table 11 show that only the official reserve is the Granger cause of the stock market index, while there is no causality between CDS premiums, interest rate, exchange rate, credit volume and stock market index. Moreover, there is no bidirectional causality between CDS premiums and the stock market index.

The results in Table 12 offer that only the interest rate is not a Granger cause of the official reserve, while otherwise all independent variables are Granger causes of the official reserve. Finally, bidirectional causality has been found between CDS premiums and official reserves.

According to the results of the model with credit volume as the dependent variable reported in Table 13, the interest rate and the exchange rate are the Granger causes of credit volume. There is no bidirectional causality between CDS premiums and credit volume.

4. CONCLUSION

This paper examines the influence of some economic and financial indicators on CDS premiums, focusing on Türkiye over the period January 2010 - March 2022. By providing evidence from a developing country that is highly dependent on international funds and characterized by fragile macroeconomic fundamentals, this study attempts to contribute to the literature. The significance of this research is further underscored by the unique policy environment of the examined period, the variety of selected variables, and the combination of estimation methods. Türkiye's policy

environment during this period represents an essential case study for understanding the dynamics of financial risk in developing countries. Policymakers implemented low-interest rate policies, which were accompanied by extraordinary macroeconomic indicators rarely observed in other countries. This process provided researchers with a natural experiment environment. Understanding the dynamics of these indicators and their impacts on Türkiye's risk perception can provide valuable insights for both policymakers and investors. To this end, 5-year CDS premiums, exchange rates ($/TL), interest rates, BIST100 index, official reserves ($1,000,000), and total domestic credit volume ($) are used as indicators.

The findings of the study indicate a positive long-run relationship between exchange rates and CDS premiums. This result is consistent with economic theory, as a depreciation of the local currency increases the repayment burden of external debt denominated in foreign currency, raising the perceived risk of default. This is in line with Buz and Küçükkocaoğlu (2023), Ho (2014) and Kılcı (2017), who highlighted the critical role of exchange rate dynamics in shaping risk perceptions, in the context of both developing and developed economies. Exchange rate volatility further exacerbates risk by discouraging foreign investors and triggering capital outflows, thereby increasing the country's risk premium. Similarly, the positive relationship between credit volume and CDS premiums suggests that a rapid increase in domestic credit may signal growing financial instability. While credit expansion can stimulate short-term economic growth, excessive or unsustainable credit booms-especially in economies dependent on external borrowing-tend to heighten concerns over asset quality and systemic risk which ultimately may elevate CDS premiums.

On the other hand, the study finds a negative long-run relationship between official reserves and CDS premiums, consistent with Ho (2014). This highlights the critical role of reserve adequacy in stabilizing risk perceptions. A high level of official reserves strengthens the government's capacity to manage external shocks, stabilize the currency, and reduce default risk, thereby boosting investor confidence. Similarly, the negative relationship between the stock market index and CDS premiums underscores the importance of equity market performance as a signal of economic stability. This result is in line with the findings of the studies by Sarıtaş et al. (2021) and Bolaman Avcı (2020). A rising stock market often reflects positive investor sentiment, improved growth prospects, and increased foreign portfolio inflows, all of which contribute to a reduction in the country's risk premium.

Interestingly, the coefficient of interest rates on CDS premiums is found to be statistically insignificant, unlike Akyol et al. (2019). These results may reflect the complexity of monetary policy dynamics in Türkiye during the examined period. While interest rate hikes can attract foreign capital and stabilize the currency, they may also signal economic distress or inflationary pressures, leading to ambiguous effects on CDS premiums.

The Granger causality analysis sheds further light on the relationships between the variables. The results reveal unidirectional causality from interest rates, the stock market index, and credit volume to CDS premiums, suggesting that these indicators play a significant role in shaping the country's risk perception. For example, an increase in credit volume may indicate growing financial sector vulnerabilities, while rising stock market performance reduces default risk by improving investor sentiment. Additionally, a bidirectional causality has been found between CDS premiums and official reserves. While higher reserves reduce perceived risk by bolstering the government's ability to respond to crises, rising CDS premiums may also incentivize policymakers to accumulate reserves as a precautionary measure.

These findings are broadly consistent with the existing literature (Sarıtaş et al., 2021; Bolaman Avcı, 2020; Buz and Küçükkocaoğlu, 2023; Ho, 2014). However, the study's focus on the unique economic environment of Türkiye, characterized by unconventional monetary policies and extraordinary macroeconomic conditions, represents an important innovative feature of our study. Policymakers pursued a low-interest rate policies, a strategy that led to unique economic dynamics rarely seen in other countries. These conditions created both challenges and opportunities for understanding the mechanism linking financial indicators and country risk. By highlighting the channels through which exchange rates, credit volume, reserves, and financial markets influence CDS premiums, this study provides valuable insights for policymakers, investors, and academics.

From a policy perspective, the results emphasize the need for maintaining strong official reserves to reduce risk perception and stabilize the currency. Robust reserve levels enhance a government's ability to manage external shocks, defend against speculative attacks, and instill confidence among foreign investors. Policymakers should also ensure that credit growth is sustainable, as excessive credit expansion poses significant risks to financial stability. Managing credit allocation effectively and strengthening financial regulations are key to mitigating systemic risks. These findings suggest that central banks in emerging markets should prioritize dynamic reserve management and adopt policies that encourage sustainable credit practices. Additionally, mechanisms for monitoring and controlling systemic risks in financial markets should be strengthened to prevent excessive risk-taking by financial institutions. Moreover, stabilizing the exchange rate and promoting equity market development are critical for reducing the country's risk premium. A stable exchange rate reduces uncertainty for foreign investors, while a thriving stock market signals economic resilience and growth potential.

In conclusion, this study provides a comprehensive analysis of the relationships between economic indicators and CDS premiums in Türkiye, with a focus on the mechanism

driving these dynamics. The findings underscore the importance of reserves adequacy credit discipline, and investor confidence in reducing country risk. By situating these findings within Türkiye's unique economic conditions and linking them to broader trends in emerging markets, this research bridges an important gap in the literature. By analyzing a period marked by unconventional policies and exceptional economic conditions, this research contributes to the literature on emerging markets and offers practical guidance for policymakers seeking to promote macroeconomic stability and attract foreign investment.

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