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Araştırma Makalesi / Research Article

Determinants of Sovereign Credit Default SWAP (CDS) Spreads in Emerging Countries: Evidence from Turkey

Mustafa Tevfik Kartal[1], Hasan Murat Ertuğrul[2] , Fatih Ayhan[3]

Abstract

Turkey faces increasing CDS (Credit Default Swap) spreads. The level of CDS spreads shows the riskiness of a country in terms of credit default and countries can't attract high foreign investment inflows when CDS spreads are high. In this context, countries need to identify the influential factors in order to decrease CDS spreads. In this study, ten independent variables classified in global, macro, and market factors are analyzed using monthly data between January 2004 and December 2019 with autoregressive distributed lag (ARDL), fully modified least square (FMOLS), dynamic ordinary least square (DOLS), and Markov Switching Regression (MSR) after applying principal component analysis (PCA). The results show that (i) market component has a greater effect than other components for all models, which indicates that it is the most important variable for Turkey's CDS spreads; (ii) global and market components are positive and statistically significant for the ARDL, FMOLS, and DOLS models; (iii) macro component is negative for all models.

Keywords: *CDS; PCA; ARDL; FMOLS; DOLS; MSR; Turkey.*

Gelişmekte Olan Ülkelerde Kredi Temerrüt Takası (CDS) Primlerinin Belirleyicileri: Türkiye'den Kanıtlar

Öz

Türkiye artan kredi temerrüt takası primleri ile karşı karşıya kalmaktadır. CDS primlerinin düzeyi, bir ülkenin kredi temerrüdü açısından riskliliğini göstermektedir ve yüksek CDS primine sahip ülkeler için yüksek yabancı yatırım girişi sağlayamamaktadırlar. Bu bağlamda, ülkeler CDS primlerini düşürebilmek için etkili olan faktörleri belirlemeye ihtiyaç duyarlar. Bu çalışmada; küresel, makro ve piyasa kategorilerinde sınıflandırılan on bağımsız değişken, 2004 Ocak ve 2019 Aralık dönemine ait aylık veriler kullanılarak temel bileşen analizi (PCA) uygulandıktan sonra Otoregresif Dağıtılmış Gecikmeli Model (ARDL), Tamamen Modifiye Edilmiş En Küçük Kareler (FMOLS), Dinamik En Küçük Kareler (DOLS) ve Markov Switching regresyon (MSR) yöntemleri ile analiz edilmiştir. Sonuçlar; (i) tüm modeller için piyasa bileşeninin diğer bileşenlere göre daha büyük bir etkiye sahip olduğunu ve Türkiye'nin CDS primleri için en önemli değişken olduğunu göstermektedir; (ii) küresel ve piyasa bileşenleri, ARDL, FMOLS, ve DOLS modelleri için pozitif ve istatistiksel olarak anlamlıdır; (iii) makro bileşeni ise tüm modeller için negatiftir.

Anahtar Kelimeler: *CDS; PCA; ARDL; FMOLS; DOLS; MSR; Türkiye.*

[1] Assoc. Prof. Dr., Borsa Istanbul Strategic Planning, Financial Reporting, and Investor Relations Directorate, mustafatevfikkartal@gmail.com, https://orcid.org/0000-0001-8038-8241
[2] Prof. Dr., Anadolu University, Faculty of Economics and Administrative Sciences, Department of Economics, hmertugrul@anadolu.edu.tr, https://orcid.org/0000-0001-9822-4683
[3] Sorumlu Yazar (Corresponding Author), Assoc. Prof. Dr., Bandırma Onyedi Eylul University, Faculty of econonocs and Administrative Sciences, Department of Economics, fayhan@bandirma.edu.tr, https://orcid.org/0000-0002-7447-5506

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INTRODUCTION

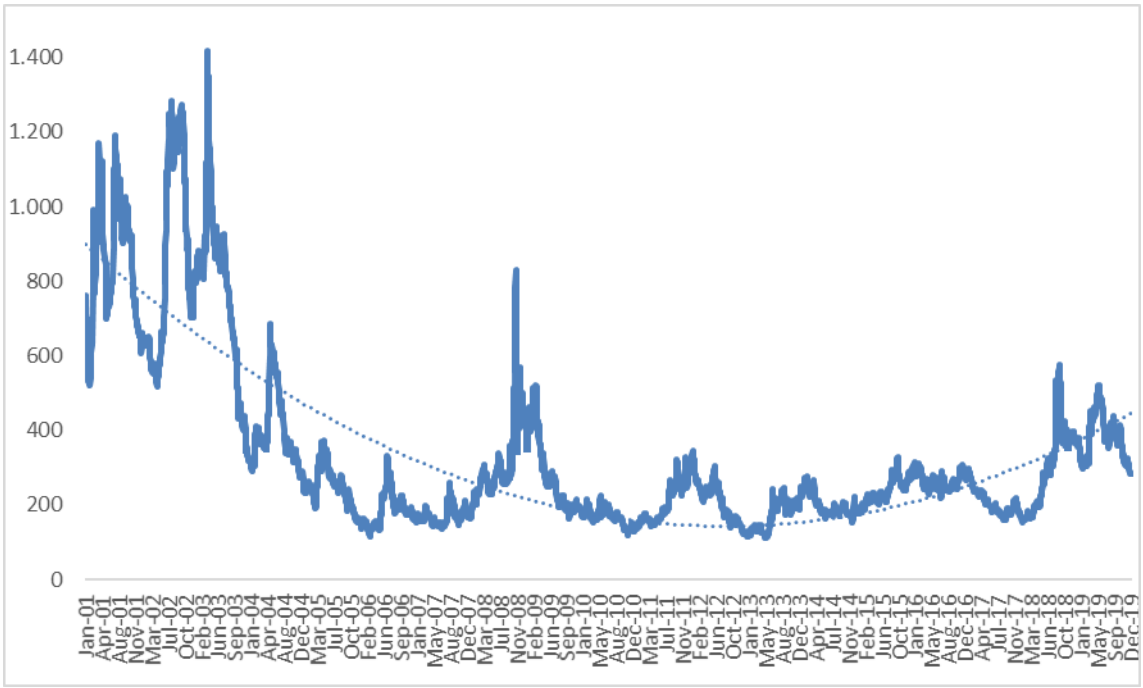
As commonly known, each emerging country makes efforts to develop. In addition to the real sector, development in financial sectors and markets is also crucial for developing countries. Besides, sustainability in financial and macroeconomic indicators, financial stability and economic growth have a considerable contribution to countries' development. Therefore, providing and sustaining stability in all these mentioned is inevitable.

There are various indicators such as inflation, economic growth, and interest rates that must be taken into account by countries. Each of them has a crucial role in terms of effects and functions in the economy. On the other hand, these indicators impact the riskiness and soundness indicators of countries like CDS (Credit Default Swap).

CDS are derivative products that are used for protection against losses on debts provided via foreign exchange denominated bonds (Hibbert & Pavlova, 2017; Kartal, 2020; The Central Bank of the Republic of Turkey (CBRT), 2020a). Depending on this definition, there are two main CDS types, which are sovereign and corporate (Shahzad et al., 2017). Sovereign CDS deals with countries, whereas corporate CDS is related to companies.

When analyzing the recent development of CDS in Turkey, it can be seen that CDS spreads went up quickly frequently. Figure 1 shows the progress of the CDS spread in Turkey between 2001 and 2019.

Figure 1: The Progress of Turkey's CDS Spreads



Source: Bloomberg, 2020.

As can be seen from Figure 1, the CDS spreads in Turkey were higher sometimes. There were quite high CDS spreads between 2001 and 2003 due to the banking crisis in Turkey. A similar condition arose around 2008 because of the global financial crisis. Also, high-level CDS spreads in Turkey have been seen after 2018 due to the financial shocks and deteriorations in macroeconomic indicators. It is known that Turkey has still quite high CDS spreads among its peers (CBRT, 2020a). On the other hand, developed countries have been enjoying low CDS spreads. In this context, it brings about that it is required to research why Turkey has high CDS spreads among its peers and which factors cause this condition.

Low-level CDS spreads are crucial for countries in terms of foreign investment inflows. CDS are essential, especially for global investors because they consider CDS spreads of countries while allocating their assets. Besides, this is a requirement for diversification (Dooley & Hutchison, 2009; Yang et al., 2018). However, low-level CDS spreads are not comfortable in the globalizing world, and countries have been much more interdependent. In such an environment, there are too many factors to be taken into account. Therefore, not only national factors but also global factors must be considered. Influential factors on CDS could be grouped as global variables, macro variables, market variables, and firm-specific variables (Galil et al., 2014; Kocsis & Monostori, 2016).

This study aims to find out the determinants of CDS spreads in Turkey by focusing on global variables, macro variables and market variables. In this context, ten variables, and monthly data between 2004 and 2019 are analyzed by using ARDL, FMOLS, DOLS, and MSR models after applying PCA. The examination focuses on Turkey because Turkey has been faced with an increasing CDS many times in recent years. The study's findings reveal that global and market components positively affect the CDS spread whereas macroeconomic components negatively affect and have a higher impact on CDS than the global and market components for Turkey.

The main contributions of the paper are that (i) examines Turkey’s case, which is a significant and pioneering emerging country; (ii) performs ARDL, FMOLS, DOLS, and MSR models in the same study. Also, the principal component analysis method is applied to reduce a group of variables to a single variable because of preventing endogenous and autocorrelation between variables; (iii) defines the determinants of Turkey’s CDS spreads by considering global, macroeconomic and market factors all together; (iv) examines a long period between 2004 and 2019 by using monthly basis data which includes 192 observations; (v) recommends some policy proposals based on analysis results. Also, the study focus solely on the determinants of Turkey’s CDS spreads, whereas most of the other studies examine the relationship between CDS spreads in Turkey and other variables.

The remaining sections of the study are organized as follows. Section 2 reviews the literature. Section 3 explains the variables, scope, data, and methods used in the study. Section 4 includes the results and a discussion the of findings. Section 5 presents the results.

1. LITERATURE REVIEW

This section of the study examines effective variables on CDS which are considered important and related to the study’s analysis. According to the literature, there are a variety of variables that affect CDS spreads. Because of this fact, it is beneficial to group variables under global, macroeconomic, and market factor groups. We position the VIX index and oil price under

global factors as consistent with the studies of Arouri et al. (2011), Che & Kapadia (2012), Hammoudeh et al. (2013), and Lahiani et al. (2016), Yang et al. (2018). Also, foreign exchange rates (FER), inflation (consumer price index (CPI)), non-financial corporate foreign exchange debt (NFCFED), and reserves are grouped in macroeconomic factors which are similar to the studies of Akçelik & Fendoğlu (2019), CBRT (2020a), and Küçüksaraç & Duran (2016). Besides, market factors included the stock index/price/return which is consistent with the studies of Shahzad et al. (2017). Moreover, non-performing loans (NPL) are positioned under this group with logical evaluation.

The first group of studies in the literature focused on the relationship with global variables. Market volatility (VIX index) is one of the leading indicators to be used. Che & Kapadia (2012) define that the VIX index can explain the changes in CDS spreads, meaning that VIX explains countries' macroeconomic risks. Ertuğrul and Öztürk (2013) include the VIX index as a variable for selected 6 emerging countries and define that the VIX index is significant in terms of CDS spreads. Galil et al. (2014) determine that the VIX index is an important variable for 718 US firms between 2002 and 2013. Hibbert and Pavlova (2017) conclude with similar results in selected 34 (9 Latin America, 13 Europe, 12 other) countries between 2009 and 2016. Akçelik and Fendoğlu (2019) use the volatility index (VIX) for Turkey between 2005 and 2017. Park et al. (2019) research the influence of volatility indexes on emerging countries' CDS spreads, and conclude that overseas market shocks have a crucial impact. Also, CBRT (2020a) uses the VIX index for Turkey between 2015 and 2019, and Kartal (2020) examines the effect of the VIX index on Turkey in 2020. All these studes, there found a strong relationship between the VIX index and CDS. Oil price is another global variable that has been added as a determinant to literature by researchers. Arouri et al. (2011), Bouri et al. (2020), Duffie et al. (2003), Hammoudeh et al. (2013), Lahiani et al. (2016), Pavlova et al. (2018), and Wang et al. (2020) point out that CDS spreads are influenced by oil prices. Therefore, oil prices may be evaluated, and their effects on CDS spreads are worth to be examined (Yang et al., 2018). Brent and West Texas Intermediate (WTI) crude oil prices are used mostly. We consider Brent crude oil prices in the study as oil price indicator by following the studies of Bouri et al. (2020), Duffie et al. (2003), Pavlova et al. (2018), and Wang et al. (2020) and with considering that Brent crude oil is used mostly in Europe and The Middle East

The second group of studies in the literature focused on the relationship with macro variables. In this group, FER, inflation (CPI), NFCFED, and reserves are examined. The effects of FER on CDS are studied. Ertuğrul and Öztürk (2013) take into consideration FER as an effecting variable for selected six emerging countries and define the variable as necessary in the explanation of CDS spreads. Fontana and Scheicher (2016) use the volatility of Euro/United States Dollar (USD) FER as a variable for examining the Euro area and defining a positive relationship. Also, Hassan et al. (2017) researched the relationship between CDS spreads and the value of the Turkish Lira (TRY) and define that CDS spreads drive the TRY's value against the USD in the post-crisis period. Besides, Kartal (2020) examines the effect of USD FER on CDS in 2020. Inflation is a factor discussed frequently. Galil et al. (2014) determine a negative relationship between unexpected inflation and CDS in the US. Also, Benbouzid et al. (2017) use inflation as a determinant and define a positive correlation in selected 30 countries' banks. A similar result is found in Turkey by CBRT (2020a). NFCFED and reserve are other influential factors on CDS. CBRT (2020a) defines a positive effect between NFCFED and CDS, whereas adverse effects are found between reserve and CDS in Turkey between 2005 and 2017.

The third group of studies in the literature focused on the relationship with market variables. In this group, interest rate, NPL, and stock index/price/return. A variety of interest rates types such as Treasury bond interest rate, spot rate, etc. have been used as interest rate indicators. Longstaff et al. (1995) use a reinvestment (spot) rate and confirm a negative relationship with CDS. Similarly, Collin-Dufresne et al. (2001) note that high spot rates decrease default probability. Alexander and Kaeck (2008) research the effect of interest rates on CDS spreads and determine that interest rates significantly affect. Galil and Soffer (2011) use yield spreads (between 20-years and 1-years bonds) and states a negative relationship in the US. Hassan et al. (2015) and Yang et al. (2018) use interest rates of global fixed income convertible bonds shown by the Thomson Reuters Qualified Global Convertible Index. Also, NPL is another variable to be used. Benbouzid et al. (2017) use NPL as a determinant of banks' CDS spreads. Besides, Merton (1974) focuses on the relationship between default risk and the market value of equity (stock returns). Alexander and Kaeck (2008) study the effect of stock returns on CDS spreads and determine that stock returns have an essential impact. Similarly, Galil et al. (2014) use stock returns as determinants and establish a negative relationship. Lahiani et al. (2016) state that stock prices have a significant effect on CDS. On the other hand, equity market prices can be used to measure pricing credit risks (Cremers et al., 2008; Zhang et al., 2009). In this context, Yang et al. (2018) use the MSCI All Country World Index as a determinant.

After reviewing the literature, Table 1 summarizes the independent variables used in the studies.

Table 1. Summary of Independent Variables

Variable Group	Variables	References
Global	Oil price	Arouri et al. (2011), Hammoudeh et al. (2013), Lahiani et al. (2016)
	Volatility	Akçelik & Fendoğlu (2019), CBRT (2020a), Che & Kapadia (2012), Ertuğrul & Öztürk (2013), Galil et al. (2014), Hibbert & Pavlova (2017), Lahiani et al. (2016), Park et al. (2019)
Macro	FER	Ertuğrul & Öztürk (2013), Fontana & Scheicher (2016), Hassan et al. (2017)
	Inflation	Akçelik & Fendoğlu (2019), Benbouzid et al. (2017), CBRT (2020a), Galil et al. (2014),
	NFCFED	Akçelik & Fendoğlu (2019), CBRT (2020a)
	Reserves	Akçelik & Fendoğlu (2019), CBRT (2020a)
Market	Interest rate	Alexander & Kaeck (2008), Collin-Dufresne et al. (2001), Galil et al. (2014), Longstaff et al. (1995),
	NPL	Benbouzid et al. (2017)
	Stock index/ price/return	Alexander & Kaeck (2008), Cremers et al. (2008), Fontana & Scheicher (2016), Galil et al. (2014), Lahiani et al. (2016), Merton (1974), Zhang et al. (2009)

As shown in Table 1, a variety of independent variables have been investigated in terms of their effects on CDS. Besides these variables, bond spreads (Blanco et al., 2005; Fontana &

Scheicher, 2016; Zhu, 2006;), credit ratings (Galil & Soffer, 2011; Hull et al., 2004; Norden & Weber, 2004), economic growth (Benbouzid et al., 2017; CBRT, 2020a), and gold prices (Arce et al., 2013; Bouri et al., 2016; Miyazaki & Hamori, 2013; Yang et al., 2018) used as explanatory variables by several researchers in the literature. On the other hand, sector-specific factors like capital ratio, leverage ratio, and NPL are used in studies (Benbouzid et al. (2017).

In general, Collin-Dufresne et al. (2001), Hassan et al. (2015), and Jorion and Zhang (2007) determine that global factors have crucial importance whereas country-specific (macro) factors don't have essential effects on sovereign CDS. On the contrary, Galil et al. (2014) define that market variables and firm-specific variables have significant explanatory power in explaining CDS spread changes. Besides, Fontana and Scheicher (2016) state that CDS premiums are much more sensitive to country-specific drivers. Hibbert and Pavlova (2017) also state that although global factors drive CDS spreads, credit rating changes, which can be evaluated as macro factors, are also influential. Moreover, Akçelik and Fendoğlu (2019) define that leading domestic macroeconomic indicators matter more strongly for country risk premium dynamics.

2. VARIABLES, SCOPE, DATA, AND METHODS

2.1. Definitions of the Variables

5-years CDS spreads are used as dependent variables in this study since 5-years CDS spreads have the most liquidity (CBRT, 2020a; Hasan et al., 2016). On the other hand, by following previous studies in literature, a total of ten independent variables have been selected as independent determinants of sovereign CDS to be examined. Table 2 summarizes the independent variables, descriptions, and expected effects on CDS.

Table 1: Details of Selected Independent Variables

Variable Group	Variables	Symbol	Description	Expected Effects
Global	Oil price	OIL	Brent Crude Oil Prices (USD)	+
	Volatility	VIX	Chicago Board Options Exchange Volatility Index	+
Macro	FER	USDTRY	USD/TRY FER	+
	Inflation	CPI	CPI (Annual %)	+
	NFCFED	NFCFED	NFCFED (USD)	+
	Reserves	RSRV	CBRT RSRV (USD)	-
Market	BIST 100 Index	BIST 100	Day Closing Value	-
	Credit Interest Rate	LENDINT	Commercial credits interest rate (Annual, %)	+
	Deposit Interest Rate	DEPINT	Deposit interest rate (Annual, %)	+
	NPL	NPL	NPL volume (TRY)	+

A positive (+) effect means that CDS increases when independent variables increase.
A negative (-) effect means that CDS decreases when independent variables increase.

2.2. Scope and Data

The study primarily investigates the effects of the global, macroeconomic, and market variables on CDS spreads in Turkey. The study's scope consists of Turkey because Turkey has been faced with an increasing CDS many times in recent years and flows of foreign investments have been decreasing. Totally 10 variables, which we are classified into global, macro, and market variables, are employed.

The study covers the period between January 2004 and December 2019. As it is known, there were some national banking crises in Turkey in 2000 and 2001, and their adverse effects continued in the following years. For this reason, data started in 2004, which was evaluated as a normal year. Moreover, there has been a global health crisis called COVID-19 continuing since the first quarter of 2020 in the world. For this reason, data for 2020 and later are not included in this study because such a period includes the effects of the COVID-19 on the indicators and this may be a subject of another study.

Data for the VIX index, oil prices, and BIST 100 index have been gathered from Bloomberg (2020), data for NPL have been gathered from Banking Regulation and Supervision Agency (2020), and data for all other variables have been gathered from CBRT (2020b).

To investigate the determinants of Turkish CDS spreads, we have classified the variables into 3 groups global, macroeconomic, and market variables. We have employed year on the year growth rate of the variables except for interest rate variables and the VIX index covering the period between 2004/1 and 2019/12.

2.3. Principal Component Analysis (PCA)

It is most likely to encounter some econometric problems such as multicollinearity and over-parameterization in the usage of ten independent variables in a model (Coşkun et al., 2017). That is why all of these variables are correlated with each other. Therefore, inconsistent results would be reached if all these variables are included in the regression. To prevent these problems, the PCA method is employed.

PCA is introduced to the literature by Karl Pearson and Harold Hotelling firstly and developed by researchers later. PCA provides simplification, data reduction, modeling, outlier detection, variable selection, classification, prediction, and this method is used for multivariate data analysis (Wold et al., 1987).

PCA explores the interdependence between variables without causal relation's direction, and it doesn't investigate the causal relationship (Coşkun et al., 2017). PCA is used to reduce a broad set of correlated variables into a smaller set of uncorrelated variables known as principal components. This method can eliminate multicollinearity problems (Nobre & Neves, 2019; Stock & Watson, 2002).

PCA steps are summarized as follows (Hardle & Simar, 2015; Liu et al., 2020; Zhao et al., 2019):

1) Uniform initial data to acquire new data with a variance of 1, an average of 0, and, which are indicated as vector Di (i=1, ….. n),

2) Adjust each derivative data's proportion by utilizing Equation (1) attributed the connection examination between derivative data and main data, and reckon the proportional data:

$$D_i^* = \omega_i D_i = (1 + \alpha_i) D_i,\ \alpha_i = \frac{|r_i| - |r_{min}|}{|r_{max}| - |r_{min}|} \quad (1)$$

where vector D*i indicates the proportioned data of the ith derivative data, ωi is the portion of the ith derivative data, ri is the association parameter between the ith derivative data and main data, and rmin and rmax indicate the lowest and utmost association parameters between the derivative data and main data, respectively,

3) Reckon the covariance matrix from the proportioned data,

4) Discover the eigenvectors and eigenvalues of the covariance matrix,

5) Reckon the association parameter between every main component and main data,

6) Re-adjust the principal components in order of reducing association parameters and calculate the content and accumulated content for each principal component,

7) Choose a subset of principal components concerning their association parameters and accumulated contents.

Ten independent variables are classified into three groups such as global, macro, and market principal components as a result of PCA[1]. The global principal component includes two variables, the macro principal component includes four variables, and the market principal component includes four variables. A detailed table of PCA showing the determination of principal components is included in Appendix-1. These new aggregated variables can seize most of the structure of the genuine dataset without causing information loss at an important amount and they still contain most of the information of the original data set (Nobre & Neves, 2019).

2.4. ARDL, FMOLS, DOLS, and MSR Models

After obtaining global, macro, and market components by applying PCA, we investigate the effects of these principal components on Turkey's CDS spreads by employing both econometric modeling tools.

Firstly, the variables' stationarity properties are investigated by employing both the conventional Ng & Perron unit root test and Zivot & Andrews (1992) structural break unit root test. The basic regression model for investigating the determinants of CDS spreads is shown in Equation 2:

$$LCDS_t = \alpha_0 + \alpha_1 Global_t + \alpha_2 Macro_t + \alpha_3 Market_t + \varepsilon_t \quad (2)$$

where LCDSt is the natural logarithm of CDS spread of Turkey at time t and Globalt is the global component, Macrot is the macro component and Markett is the market component obtained via PCA by using the variables explained in the data section. εt denotes the usual error term.

After stationarity checks, the effects of global, macro, and market components on Turkey's CDS spreads are investigated by employing ARDL, FMOLS, DOLS, and MSR models. These models are used for robustness checks as well.

Later, we employed ARDL, FMOLS, and DOLS models. ARDL model is applied to obtain long-term coefficients for the investigated variables. The ARDL model specification for the study is presented as follows:

$$LCDS_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\, LCDS_{t-i} + \sum_{i=0}^{m} \alpha_{2i}\, Global_{t-i} + \sum_{i=0}^{p} \alpha_{3i}\, Macro_{t-i} + \sum_{i=0}^{p} \alpha_{4i}\, Market_{t-i} + \mu_t \quad (3)$$

After the ARDL model, FMOLS and DOLS models are employed for robustness checks. FMOLS models present reliable results for serial correlation, endogeneity, and multicollinearity compared to the OLS model. DOLS models use differenced right-hand side lead and lag variables to consider endogeneity and autocorrelation problems (Stock & Watson, 2002).

Moreover, the MSR is employed to investigate the determinants of CDS spreads in Turkey. The MSR model is a linear regression model with nonlinearities based on separated alterations in the regime. Two regimes are taken upon in the economy, which are regime 1 and regime 2, indicating the senior and weak volatility regimes, respectively. The condition of volatility is counted to be the result of an unobserved first-order Kth condition Markov method, defined by transition likelihoods, $P(s_t = k/s_{t-1} = i) = p_{ij}$. Each probability figure, p_{ij} is the likelihood that condition *i* comes after by condition of *j* (Bautista, 2003). The first-order Markov assumption entails the likelihood of being in a regime base on the former condition (Ertuğrul & Öztürk, 2013). Therefore, the succession likelihood matrix is reduced to:

$$p = \left|\frac{p_{11}}{p_{12}}\frac{p_{21}}{p_{22}}\right|, \text{ where } \sum_{j=1}^{2} p_{ij=1} \quad (4)$$

3. EMPIRICAL ANALYSIS

3.1. Descriptive Statistics

The dataset consists of monthly measured variables from 192 observations that occurred from January 2004 to December 2019. Table 3 presents the descriptive statistics for variables that are important to understanding the dataset's basic characteristics.

Table 2: Descriptive Statistics

Variable	Observation	Average	Standard Deviation	Minimum	Maximum
CDS[1]	192	245.32	90.99	117.81	593.62
BIST 100	192	63,347.94	26,069.36	17,081.08	119,528.80
CPI	192	9.40	3,39	3.98	25.24
DEPINT	192	13.10	4.87	5.95	26.47
LENDINT	192	16.64	5.42	8.42	34.48
NFCFED[2]	192	-117.05	70.79	-223.13	-13.60
RSRV[2]	192	78.33	21.67	32.44	114.28
NPL[3]	192	33.76	30.88	5.88	150.11
OIL	192	74.17	25.91	30.80	133.89
USDTL	192	2.34	1.32	1.18	6.38
VIX	192	18.29	7.99	9.51	59.89

[1]Dependent Variable; [2]Billion USD; [3]Billion TRY.

As Table 3 shows, CDS spreads in Turkey have a broad range between 117 and 593. Similarly, other variables have quite high values for the period examined. Besides, the standard deviation of CDS spreads, BIST 100 index, NFCFED, NPL, OIL, and RSRV are relatively high concerning other variables.

3.2. Analysis Results

In the context of empirical research, stationarity properties of the variables by employing the Ng & Perron (2001) unit root test, which gives robust results according to other conventional tests, especially for small samples (Ertuğrul & Soytaş, 2013), and structural break unit root test is investigated (Zivot & Andrews, 1992). Stationarity test results indicate that all variables are stationary.[2]

After examining the variables' stationarity, both ARDL, FMOLS, DOLS, and MSR are estimated to investigate the determinants of Turkey's CDS spreads. The results of the ARDL, FMOLS and DOLS models are presented in Table 4 and Table 5.

Table 4: ARDL[3], FMOLS, and DOLS Models

Variables	ARDL	FMOLS	DOLS
Global	0.097 [0.050]**	0.063 [0.015]*	0.052 [0.025]**
Macro	(-0.050) [0.035]	(-0.077) [0.011]*	(-0.082) [0.019]*
Market	0.131 [0.035]*	0.123 [0.011]*	0.125 [0.019]*
C	5.403 [0.047]*	5.403 [0.015]*	5.402 [0.025]*

Notes: ** and ** denote 1 and 5% significance levels, respectively. Brackets indicate standard errors.*

As shown in Table 4, the coefficients of the global and market component are positive and statistically significant for the ARDL, FMOLS, and DOLS models. The global component coefficient is found between 0.052 and 0.097 and indicates that a 1-point increase in global component causes (0.052-0.097) point increase in CDS spreads. The market component coefficient is found between 0.123 and 0.131 and demonstrates that a 1 point increase in market component causes (0.123-0.131) point increase in CDS spreads. The macro component coefficient is negative for all models and between (-0.050) and (-0.082). It is statistically significant for FMOLS and DOLS models, however, insignificant for the ARDL model. On the other hand, the market component's coefficient is higher than other components for all models which indicates that the market component is the most essential variable for Turkey's CDS spreads.

Table 5: MSR Model

Variables	Markov Model
	REGIME 1 (low volatility)
Global	0.127 [0.017]*
Macro	(-0.071) [0.008]*
Market	0.121 [0.009]*
C	5.249 [0.014]*
REGIME 2 (high volatility)	
Global	0.031 [0.015]**
Macro	(-0.030) [0.016]
Market	0.163 [0.013]*
C	5.603 [0.016]*

Notes: ** and ** denote 1 and 5% significance levels, respectively. Brackets indicate standard errors.*

As shown in Table 5, the results of the MSR model are compatible with the results of the ARDL, FMOLS, and DOLS models. Global and market components have positive and statistically significant for all regimes parallel to ARDL, FMOLS, and DOLS results. The global component coefficient is found between 0.031 and 0.127 and indicates that a 1 point increase in global component causes (0.031-0.127) point increase in CDS spreads. The market component coefficient is found between 0.121 and 0.163 and indicates that a 1 point increase in market component causes (0.121-0.163) point increase in CDS spreads. The macro component is

negative for all regimes but statistically significant for Regime 1 (coefficient is - 0.071) and insignificant for Regime 2 (coefficient is -0.030). Also, the global component coefficient is higher than other components in the low volatility regime, which indicates that the global component has the highest explanatory power concerning other components in the explanation of Turkey's CDS spreads according to the ARDL, FMOLS, and DOLS models. Moreover, the market component coefficient is higher than other components in high volatility regime, which indicates that the market component has the highest explanatory power concerning other components in the explanation of Turkey's CDS spreads according to the MSR model.

The MSR model shows that CDS spreads of Turkey are affected mainly by global variables (volatility index & crude oil prices) in low volatility since this is important in the daily routine performing of Turkey's economy. On the other hand, although global variables are still important, market variables (BIST 100 index, NPL, lending, and deposit interest rates) have much more significance in the determination of Turkey's CDS spreads when there is a high-volatility. These results also imply that Turkey should focus on the local (market) drivers of CDS spreads in high-volatility periods.

3.3. Discussion of the Findings

In the first stage of the analysis, ten independent variables are categorized under three principal components by applying PCA. The global principal component includes oil prices and the VIX index. The macro principal component consists of inflation, FER, non-financial corporate foreign exchange debt, and gross reserves. The market principal component BIST 100 index, commercial credit interest rates, deposit interest rates, and non-performing loans as well.

In the second stage of the analysis, ARDL, FMOLS, DOLS, and MSR models are applied. It is determined that all variables are stationary as a precondition. The results of ARDL, FMOLS, and DOLS models are quite similar. According to these models, the market component has a positive and the highest coefficient (0.131 in ARDL, 0.123 in FMOLS, 0.125 in DOLS), and all of these are significant. The global component has a positive and significant coefficient similar to the market component (0.097 in ARDL, 0.063 in FMOLS, 0.052 in the DOLS). On the other hand, the macro component has a negative coefficient (-0.050 in ARDL, -0.077 in FMOLS, and -0.082 in DOLS. ARDL model coefficient is found insignificant, while FMOLS and DOLS model coefficients are found to significant). These results show that market and global components have a positive effect, whereas the macro component harms CDS spreads in Turkey.

Besides, the MSR model is applied. The model results show that market and global components have a positive and macro component has a negative coefficient. These results are similar and consistent with the ARDL, FMOLS, and DOLS models. However, the effect of the market component is far ahead of global and market components in the high volatility regime. On the other hand, the impact of the market component is very close to the global component in low volatility. Therefore, these results imply the regimes (high or low) are essential in determining CDS spreads.

The analysis results show that the market (BIST 100 index, commercial credit interest rates, deposit interest rates, non-performing loans) and global (oil prices, VIX index) components have a positive effect on Turkey's CDS spreads. On the other hand, the macro (inflation, FER, non-financial corporate foreign exchange debt, gross reserves) component harms Turkey's CDS spreads. These results for market and global variables are generally consistent with the author's pre-expectations and the present studies taking place in the literature such as Akçelik &

Fendoğlu (2019), Alexander & Kaeck (2008), CBRT (2020a), Collin-Dufresne et al. (2001), Ertuğrul & Öztürk (2013), Galil et al. (2014), Hassan et al. (2017), Lahiani et al. (2016), Park et al. (2019)). On the other hand, although the expected effects of each macro variable on CDS spreads are mainly positive, we define that the macro principal component does not have a statistically significant effect in the ARDL model and MSR model regime 2 (high volatility), and a has a negative impact in all other models.

It would be beneficial to recommend policy proposals to make CDS spreads in Turkey decrease depending on the analysis results. In this sense, authorities and policy-makers should focus on market factors first. In this context, keeping BIST 100 index at higher levels, deposit and interest rates, and non-performing loan volume at lower levels is the point to be focused on and worked on. Also, authorities should consider the effect of the regimes, which is determined as necessary according to the result of the MSR model. Because, although the sign of coefficient (either positive or negative) is not changed according to the regimes, the power of variables' effects on CDS spreads is changed. Besides, authorities should try to decrease of adverse effects of global factors such as oil prices via the foreign exchange rates channel. Moreover, the authorities should develop new measures to provide increases in reserves, and decreases in inflation, FER, and non-financial corporate foreign exchange debt, which affects all-economy via various channels.

4. CONCLUSION

By considering the role of the level of CDS spreads in terms of affecting foreign investment inflows via securities in emerging countries, the study focuses on the determinants of Turkey's CDS spreads. In this context, 5-year CDS spreads are used as dependent variables that have the most liquidity. Besides, the monthly data between 2004 and 2019 were obtained from Bloomberg, BRSA, and CBRT sources, and 10 independent variables were selected with benefitting from the present literature. Also, principal component analysis, ARDL, FMOLS, DOLS, and MSR models are applied.

By applying principal component analysis, ten independent variables are reduced to three principal components which are the global, macro, and market. The global component includes oil prices and the VIX index. Macro component inflation, foreign exchange rates, non-financial corporate foreign exchange debt, and central bank (gross) reserves. Also, the market component consists of BIST 100 index, credit interest rates, deposit interest rates, and non-performing loans as well. Depending on the results of the ARDL, FMOLS, and DOLS models, the market component is determined as the most influential component of Turkey's CDS spreads. Besides, the results of MSR are similar except that the coefficients of components change according to the regime (high or low volatility). The empirical results suggest that Turkey should focus on market variables firstly to decrease sovereign CDS spreads. These findings of the study have implications for authorities and policy-makers of Turkey. Macro and global variables should be considered after achieving success in market variables. The results obtained from the principal component analysis, ARDL, FMOLS, DOLS, and MSR models are generally consistent with the pre-expectations and present studies in the literature.

In addition to proposals recommended in the study, authorities could consider additional measures considering the economic structure and realities of Turkey. For example, Turkey has a current account deficit generally except for negative economic growth periods and this is considered by international credit agencies in the credit rating of the country which makes

a negative (increasing) effect on CDS spreads. Also, providing a decrease in the dependence on foreign liquidity inflows via securities investments would make a certainly positive (decreasing) effect on Turkey's CDS spreads. Therefore, the decreasing effect on CDS spreads could be provided by taking measures in such areas.

As an emerging country, Turkey may not lower the adverse effects of global factors on CDS spreads. However, Turkey can decrease the adverse effects of market variables, which are mostly under the control of the country on CDS spreads. Hence, a decrease in CDS spreads could be provided. This is quite important because CDS spreads mainly reflect the risk perceptions of foreign investors for countries. Also, the efforts to decrease the contagion effect through stabilizing FER, hence inflation and interest rates in turn on CDS spreads are quite essential, significant, and well appreciated. Besides, considering the interactions between variables has very high importance. It has been nice to see the efforts of authorities for this in policy-making and policy implementation processes to provide decrease Turkey's CDS spreads.

It is a crucial point which should be pointed out that necessary measures should be taken on time without causing any delays for that they could contribute to the decrease of Turkey's CDS spreads which is quite effective in terms of foreign investment inflow via securities. Also, the effects of the variables should be analyzed continuously. Because the effects of the variables could be changed according to periods whether Turkey's economy is in a stable or turbulent period. Depending on the economic condition, the variables which should be prioritized may be changed. Therefore, continuous analysis is required. This may be dealt with by positioning CDS spreads in the country as a macro-prudential concern and appointing a regulatory body as a response to CDS spread like CBRT. It should not be forgotten that CDS spreads are also significant for reflecting the financial stability of countries.

The study's main limitation is that the study considers Turkey because of high-level CDS spreads recently. However, some other emerging countries have high-level CDS spreads, which are Venezuela, Argentina, Ukraine, Pakistan, Egypt, and South Africa. Specifically, Venezuela and Argentina are the countries that have the highest CDS spreads in the world. Therefore, new studies including different bundle countries, various bundles of countries, and country groups like BRICS-T, E7, Fragile Five, G20, and MINT are highly recommended. Also, new variables, which are present in the literature but not used in the study because of data interval restrictions, could be added to the analysis and different and new statistical and econometric methods such as machine learning algorithms, multivariate adaptive regression splines, neural networks, wavelet coherence approach could be used in the new studies to examine CDS spreads of countries. Furthermore, data after 2020 that includes the pandemic times, can be included in new studies so that the effects of the pandemic on the CDS spreads can be examined.

AUTHOR STATEMENT

Statement of Research and Publication Ethics

This study has been prepared in accordance with scientific research and publication ethics.

Author Contributions

Mustafa Tevfik Kartal: Contribution rate (35%)

Hasan Murat Ertuğrul: Contribution rate (35%)

Fatih Ayhan: Contribution rate (30%)

Conflict of Interest

There is no conflict of interest for the authors or third parties arising from the study.

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Data Availability

The data that support the findings of this study are openly available in Bloomberg Terminal, Banking Regulation and Supervision Agency available at https://www.bddk.org.tr/BultenAylik/En, and the Central Bank of the Republic of Turkey available at https://evds2.tcmb.gov.tr.

NOTES

[1] By applying PCA, global, macro, and market indicators correspond to the first principal component, the only one with an eigenvalue higher than 1, and which clarifies about 60% of the aggregate variance. The residual principal components are not considered as their marginal contributions are notionally minor, i.e., the matching eigenvalues are much little than 1. The synthetic variables, namely the aggregate measure of, are computed as a linear combination of indicators with weights given by the first eigenvector.

[2] We do not report the stationarity test results to save space. Stationarity test results could be taken from authors upon request.

[3] ARDL model diagnostic checks indicate no serial correlation, heteroscedasticity, and normality problems. The results are available from authors upon request.

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Appendix 1. Principal Component Analysis Details

Market Component				
Number	**Value**	**Proportion**	**Cumulative Value**	**Cumulative Proportion**
1	2.4736	0.6184	2.4736	0.6184
2	0.7848	0.1962	3.2584	0.8146
3	0.5542	0.1385	3.8126	0.9531
4	0.1874	0.0469	4.0000	1.0000
Macro Component				
Number	**Value**	**Proportion**	**Cumulative Value**	**Cumulative Proportion**
1	2.3576	0.5894	2.3576	0.5894
2	0.8640	0.2160	3.2216	0.8054
3	0.4260	0.1065	3.6476	0.9119
4	0.3524	0.0881	4.0000	1.0000
Global Component				
Number	**Value**	**Proportion**	**Cumulative Value**	**Cumulative Proportion**
1	1.1841	0.5920	1.1841	0.5920
2	0.8158	0.4080	2.0000	1.0000