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- RESEARCH ARTICLE -

DETERMINING THE COUNTRY-SPECIFIC VARIABLES AFFECTING THE MARKET VALUE OF TURKISH EUROBONDS: NARDL APPROACH

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Abstract

This study aims to determine the country-specific variables influencing the market value of eurobonds issued by the Republic of Turkey Ministry of Treasury and Finance. The research covers the period from January 2012 to June 2020. For the study, the 102-month time series are analyzed with the NARDL model. Parallel to the model, independent variables are decomposed into positive and negative shocks, and these components are added to the model. Thus, the existence of a significant asymmetric cointegration relationship is investigated. The results of the bounds test prove that there is a long-term cointegrated relationship among variables. According to the findings, the negative and positive shocks of credit default swap in both the short and long term significantly affect the Turkish eurobond market value. However, the negative shock has a more significant impact. The negative shock of total international reserves in the short term and the negative shock of the current account in the long term significantly affect the Turkish eurobond market value. On the other hand, low bond issuance costs during low CDS periods will encourage the Turkish government to issue eurobonds. In that case, the market value of the Turkish eurobond will rise. Contrary to the significant and positive relationship between inflation and eurobond return in the literature, the Consumer Price Index does not significantly affect Turkey's eurobond prices. Similarly, although it is argued that the budget balance significantly affects the yields of government bonds, the findings of the study show otherwise; it does not have a significant impact on eurobond market value.

Keywords: *Eurobond, Credit Default Swap, Asymmetric Relationship, NARDL, Cointegration.*

JEL Codes: *C58, G12, H63.*

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TÜRK AVROVİLLERİNİN PİYASA DEĞERİNİ ETKİLEYEN ÜLKEYE ÖZGÜ DEĞİŞKENLERİN BELİRLENMESİ: NARDL YAKLAŞIMI[3]

Öz

Bu çalışmanın amacı, TC Hazine ve Maliye Bakanlığı tarafından ihraç edilen avrovillerin piyasa değerini etkileyen ülkeye özgü değişkenleri belirlemektir. Çalışma Ocak 2012'den Haziran 2020'ye kadar olan dönemi kapsamaktadır. Çalışmanın amacı doğrultusunda, 102 aylık zaman serisi verileri NARDL modeli ile analiz edilmektedir. Modele uygun olarak, bağımsız değişkenler pozitif ve negatif şoklarına ayrıştırılmaktadır ve elde edilen bu bileşenler modele eklenmektedir. Böylece anlamlı bir asimetrik eşbütünleşme ilişkisinin varlığı araştırılmaktadır. Sınır testinin sonuçları değişkenler arasında uzun dönemli eşbütünleşik bir ilişkinin olduğunu kanıtlamaktadır. Bulgulara göre, hem kısa hem de uzun dönemde kredi temerrüt takasının negatif ve pozitif şokları Türk avrovillerinin piyasa değerini anlamlı şekilde etkilemektedir, ancak negatif şokun etkisi daha fazladır. Ek olarak, kısa dönemde toplam uluslararası rezervlerin negatif şoku, uzun dönemde ise cari işlemler hesabının negatif şoku Türk avrovillerinin piyasa değerini anlamlı şekilde etkilemektedir. Öte yandan, düşük CDS dönemlerinde, ihraç maliyetlerinin düşük olması Türkiye'yi avrovil ihraç etmeye teşvik edecektir. Bu durumda Türkiye'nin avrovil piyasa değeri artacaktır. Literatürdeki enflasyon ile avrovil getirisi arasındaki anlamlı ve pozitif ilişkinin aksine, Tüketici Fiyat Endeksi Türkiye'nin avrovil fiyatlarını anlamlı şekilde etkilememektedir. Benzer şekilde, bütçe dengesinin devlet tahvillerinin getirilerini önemli ölçüde etkilediği iddia edilmekle birlikte, çalışmanın bulguları aksini göstermektedir, bütçe dengesi avrovil piyasa değeri üzerinde anlamlı bir etkiye sahip değildir.

Anahtar Kelimeler: *Avrovil, Kredi Temerrüt Takası, Asimetrik İlişki, NARDL, Eşbütünleşme.*

JEL Kodları: *C58, G12, H63.*

"Bu çalışma Araştırma ve Yayın Etiğine uygun olarak hazırlanmıştır."

***** *Makalemizin değerlendirme sürecinde emeği geçen hakemlere değerli, yapıcı ve yardımcı yorum ve önerileri için* şükranlarımızı sunarız. *Ayrıca yayın ekibine de ilgilerinden dolayı teşekkür ederiz.*

1. INTRODUCTION

The euromarkets, which are not dependent on any country's monetary authority, consists of the euro currency markets where short-term transactions are made and the eurobond markets where long-term transactions are made. Eurobonds are securities issued without restriction in

3 Genişletilmiş Türkçe Özet, İngilizce makalenin aşağısında yer almaktadır.

an internationally recognized currency and guaranteed by an international consortium (Finnerty & Nunn, 1985: 23). Thanks to its no less stringent regulations, the eurobond market has been booming in attracting different types of borrowers from domestic markets. This market offers more financing flexibility for borrowers and better diversification for investors. These opportunities contribute to the continuous development of new types of financial instruments such as bond swaps and convertible bonds and improving the structure of traditional instruments issued and traded in national markets. The leading issuers of the eurobond are multinational corporations, governments, and international organizations. Governments are among the most important actors borrowing from the eurobond market. They often turn to these markets to finance individual projects and current account deficits or increase their foreign exchange reserves (Amira, 2004: 795). Turkey has also been tended many times the eurobond market and becomes one of its major issuers. Via the Eurobond markets' possibilities, such as the flexibilities and the long-term ability to borrow, Turkey tends to them. Thus, an essential source of external funding is provided for the financial sustainability of the Treasury.

This study aims to determine the country-specific macro variables affecting the market value of eurobonds issued by the Republic of Turkey Ministry of Treasury and Finance. Researchers and readers can evaluate the contribution of the study to the literature in three points. Firstly, determining the variables found to affect the eurobond market value provides investors with the indicators they should consider. It reveals the variables affecting capital costs to create external funds for the governments. Secondly, we implement an asymmetric model in line with the purpose of the study provides the opportunity to obtain a piece of broader information, unlike the symmetric models using relatively frequently in the literature. In parallel to this objective, we include the negative and positive shocks or components of the model variables. Based on the argument that the effect and power of negative and positive shocks on a dependent variable will not be the same, we can measure their impact and compare their impact strength. Thirdly, although there are frequent researches for various securities in the local literature, we have observed very few studies focusing on eurobonds. In this respect, the research contains originality and contributes to the literature.

In line with the purpose of the research, we organize the study as follows. The first subtitle, based on the literature of factors influencing the securities returns, focuses on the variables' theoretical background in different categories explaining the government bond yield. In the second subtitle of the introduction, we offer an exhaustive literature review that empirically deals with eurobonds supplied by governments. In the second main title following the introduction, we submit the data and explain the methodology. In the third main title, we apply the method for the data set we collected and report the findings, and we discuss them in the fourth main title. We conclude the research by carrying out some assessments connected to the variables influencing the market value of Turkish eurobonds.

1.1. Theoretical Framework

The yields of eurobonds in free markets, where there are no restrictions on international capital flows, should not be different from those of bonds with equivalent risk in the same currency in the domestic market. Otherwise, borrowers attempt to issue their bonds with lower returns, and investors desire to shift their funds to markets with a higher return. These preferences of borrowers and investors ensure that the rates in both markets are the same. Whence, this arbitrage opportunity makes sure that the two markets are fully integrated after a while. According to the arbitrage approach, equally risky securities cannot be bought and sold at different prices in competing markets. Nevertheless, suppose efficient arbitrage is blocked by asymmetric information or government constraints. In that case, the two markets will be segmented to some extent, and the returns of "equally risky" local bonds and eurobonds will be different (Finnerty & Nunn, 1985: 24).

Adedeji and McCosh (1995: 1108) point out that eight forces are known to affect returns on investments in the literature, specifying that most, if not all, apply to eurobonds. The first of the eight forces is the default risk, which Modigliani and Miller (1958) claimed to be positively associated with securities returns. The second force is the combination of the risk-free interest rate and systematic risk defined in the Capital Assets Pricing Model (CAPM). The systematic risk studied by Sharpe (1964) is due to the volatility of returns. The combination of them is expected to be positively associated with eurobond returns. The third force is the securities effect. Jensen and Meckling (1976) and other proponents of the Agency Theory anticipate a reduction in the yield on securities, associated with the awareness of the rights and obligations in the principal-agent contract and the agency relationship's reduced costs.

Fisher (1959) claims that inflation, described as the fourth force, positively affects returns and talks about the first time's maturity effect. The longer the maturity, defined as the fifth force, the higher the return is expected. Liquidity Preference Theory is the primary motivation source of interest payment frequency, which is the sixth force. Suppose two bonds are paying the same interest. Ceteris paribus, the price of a multi-paying bond during the year will be higher than the bond that only pays at the end of the year. Solnik (1983), who mentions the last two forces' existence, suggests that the country effect and the exchange rate risk are two factors to be taken into account in determining securities' prices. Even though the country effect can be positively or negatively associated with the yield on securities, exchange rate risk is expected to be positively associated. To summarize, considering the findings of the studies on bond yields, a positive relationship is expected between default risk, the combination of systematic risk and risk-free interest rate, inflation, maturity, exchange rate risk, and the bond yield. Findings on the impacts of securities and country effects on the bond yield are not coherent with each other. Finally, a negative relationship is expected between the frequency of interest payments and the bond yield (Adedeji & McCosh, 1995: 1107-1109).

Min et al. (2003: 273-275) mention that three variables impress developing countries' bond yield margins. These are liquidity and solvency variables, macroeconomic factors, and exogenous shocks. The variables making up the first group can be categorized as follows: Import, export, external debt ratio, international reserves, GNP, current account, and debt service ratio. The second group variables can be grouped as follows: Inflation, terms of trade, and real exchange rate. External shocks, expressed as the last and third category, include US Treasury bill rates and actual oil prices. Amira (2004), on the other hand, emphasizes that five factors affect the bond yield margin in the light of the findings obtained from the literature review. They can be listed as follows: Maturity, size of the issue, call option, credit rating, and borrowing frequency. Depending on the Liquidity Preference Theory, a positive relationship is expected between maturity and return. Long-term fixed-rate bonds offer higher returns to minimize the risk, as they will be subject to more price volatility than short-term bonds. Fisher (1959) uses the security size as an indicator for the issue's liquidity or marketability. He puts it the size of the unpaid bonds decreases the yield margin and increases the probability of an active market for issuers. Ferri (1979), another contributor, argues that the borrower must pay higher premiums inasmuch it protects against decreases in interest rates with the call option.

Many researchers point to the role of country-specific macroeconomic factors in explaining changes in credit risk margins. Edwards (1984), who examines the factors taken into account in channeling international financial resources to developing countries, defend that lenders in euromarkets pay attention to some of the risk characteristics of borrowers. Accordingly, the external debt ratio and debt service ratio positively affect the credit risk margin, while international reserves and investment risk appetite negatively affect. Min (1999), who investigated the factors affecting the bond yield margin in developing countries in the 1990s, reveals the importance of a comprehensive set of macroeconomic variables as follows: domestic inflation rate, net foreign assets, terms of trade index, and real exchange rate.

The neo-classical theory claims that the cash flow from developed countries to developing countries is a high yield. Conversely, Lucas (1990: 92-96) interprets it as a paradox that the lion's share of investments is canalized in developed countries rather than developing countries with high returns. Those who support this view have elicited the invalidity of the Neo-classical claim with many empirical studies. Most researchers now acknowledge that capital flows are driven by both "push" factors from countries where lenders reside and "pull" factors from borrowing countries (Senga et al., 2018: 49).

1.2. Literature Review

Finnerty and Nunn (1985) check out the relationship between interest rates in the eurobond market and compare them with the US bond market interest rates. Moreover, they aim to detect the determinants of eurobond interest rates in different rating categories using the

regression model. Considering the study's findings, they discover that the yield margins of eurobonds are lower than those issued in the US market. They also find that coupon payments positively affect the eurobond return margins in all rating categories.

Adedeji and McCosh (1995) peruse the impact of interest payment frequency, the security of the bond, maturity, default risk, and country risk on eurobond returns. For this purpose, they test a data set of eight countries. They conclude that all variables, except for a Moody's rating in the range B or C, are significantly associated with eurobond returns.

Min et al. (2003) scrutinize the effects of liquidity and solvency variables, macroeconomic factors, and exogenous shocks on eleven emerging economies' bond yield margins. The findings demonstrate that liquidity and solvency variables and macroeconomic factors explain most bond yield margin changes. Besides, the change in the US interest rate explains the yield margin changes in emerging economies.

Amira (2004), whose goal to determine the factors determining the yield margins of eurobonds, investigates the eurobond issues of 38 countries. Accordingly, they analyze the monthly data set from January 1991 to November 2000 with the regression model. They confirm that eurobond yield margins are determined by country-specific credit ratings of Moody's and Standard & Poor's and some country-specific macroeconomic indicators. Macroeconomic indicators are inflation, budget balance, current account balance, and GDP per capita.

Clark and Lakshmi (2006) examined the determinants of Indian eurobond prices and tested a data set belonging to 1990-1992 by using the regression model. According to the model findings, the only factor affecting Indian eurobonds during the relevant period is the risk-free rate change.

Baldacci et al. (2008) delve into the variables explaining the country risk premium measured as the government bond yield margin in their study covering 30 emerging economies. To achieve this goal, they use a panel data set covering the period from 1997 to 2007. Findings present that the effects of financial variables on country risk premium are more significant than political risk factors.

Buket (2009), who uses a data set containing the period from January 2003 to October 2008, intends to determine Turkey's internal and external factors affecting the eurobond yield margin. To achieve this purpose, the author utilizes the JP Morgan EMBI Turkey Index representing the eurobond yield margin. This index is negatively associated with 10-year US bond yields in the model used daily data, positively related to the VIX index. In the model used monthly data, the VIX index and the ratio of net international reserves to GDP significantly affect it.

Using daily data from January 1999 to March 2007, Imer-Ertunga (2010) controls the relationship between EMBIG Indices of seven developing countries and 10-year US bond returns. The author employs correlation, Granger causality, and panel probit methods to test

this. Panel probit forecasts prove that rises in 10-year US bond yields increase the likelihood of volatility in EMBIG indices' returns. On the other hand, the correlation and Granger causality methods' findings indicate that the effect of 10-year US bond returns on the returns of EMBIG indices is not significant.

Implementing the Bayesian Model Averaging method, Maltritz (2012) analyses the government bond yield margins of EU Economic and Monetary Union member countries from 1999 to 2009. The findings suggest that the country-specific variables influencing the government bond yield margin are trade balance, budget balance, and public debt. It is concluded that global financing conditions represented by the US interest rate and market sentiment expressed by corporate bond yield margins also affect government bond yield margins.

Another notable research by Feyen et al. (2015) shed light on the importance of bond-specific characteristics in determining emerging economies' international bond returns in the primary market. Their analysis controlled global and country-specific factors, and they benefit a sample of 71 countries between 2000 and 2014. The findings display that bonds' maturity has a statistically significant and positive effect on primary market returns, but bond size does not.

Presbitero et al. (2016), who check the determinants of the bond issuance power of developing countries and the factors affecting their bonds' yield margins, operate an observation of 105 developing countries from 1995 to 2014. The findings indicate that economically advanced countries, have a higher per capita GNP, have lower public debt, and have management effectiveness are more likely to issue bonds. In addition to this find, countries with strong financial positions, strong economic growth, and management effectiveness have lower government bond yield margins. They are more likely to issue bonds during times of high global liquidity and commodity prices.

Senga et al. (2018) research the variables affecting the secondary market eurobond returns of 14 Sub-Saharan African countries. Accordingly, they analyze the data covering the period from January 2008 to June 2017 and divide it into three categories: global factors, country-specific factors, and eurobond-specific factors. They apply a panel error correction model as the analysis method. Model results demonstrate that country-specific factors such as inflation and GDP growth are more significant than factors in other categories explaining eurobond performance. When global and country-specific factors are included in the model, it is observed that eurobond-specific factors do not have a significant effect. Similarly, Senga and Cassimon (2019) examine the spillover effects of Sub-Saharan African countries among secondary market eurobond returns. The results prove that there are essential contagion effects among the eurobonds yields and that the returns are sensitive to considerable economic developments and sensational news.

2. METHODOLOGY

2.1. Data Set

In this study, we select the country-specific variables predicted to affect the Turkish eurobond market value, resulting from the relevant literature review. While collecting data sets, we target to test the most extensive period possible. For this reason, we consider 102-monthly time-series data from January 2012 to June 2020. Country-specific variables are in the Table 1 below. The table also includes the abbreviations for variables in the following sections of the study and sources of variables.

Table 1: The Variables and Data Set

Variables	Abbreviation	Components	Unit	Source
Turkish Eurobonds Market Value	TREB		$	EVDS
Credit Default Swap	CDS	CDS^-, CDS^+	%	DataStream
Current Account	CIH	CIH^-, CIH^+	$	EVDS
General Government Balance	GBD	GBD^-, GBD^+	$	EVDS
Consumer Price Index	TUFE	$TUFE^-$, $TUFE^+$	%	EVDS
Total International Reserve	TUR	TUR^-, TUR^+	$	EVDS

Note: The negatively signed component defines the variable's negative shock, and the positively signed component defines the positive shock of the variable.

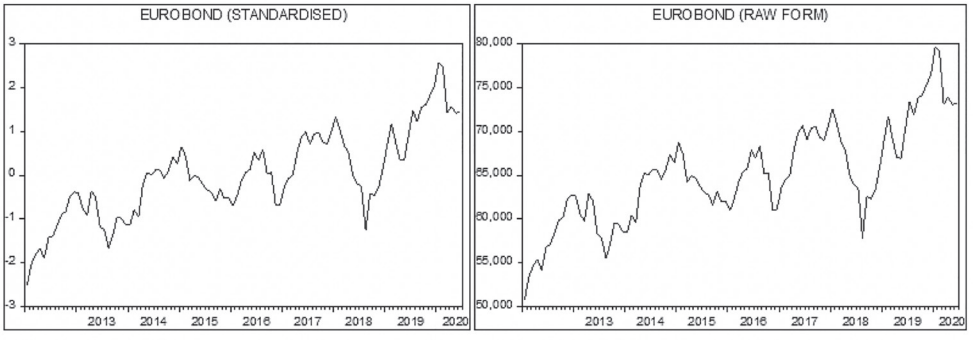
Since the data in different units would make it difficult to interpret the analysis results, we include standardized forms of the data instead of their raw forms. We perform the standardization process by creating a new time series formed by subtracting each value in the time series from the whole series's average and dividing it by the standard deviation of the entire series. There is no loss of information in the new time series resulting from this process. The readers can compare the figures below regarding both the actual market values and the standardized market values of the Turkish eurobonds.

If the raw values and standardized values of the eurobonds are compared in Figure 1, the only difference is that the actual value has shrunk. We implement the same operation to all independent variables, making it easier to interpret the model output.

2.2. Method

With their studies supporting each other, Pesaran et al. (1999) and Pesaran et al. (2001) propose the ARDL model (Autoregressive Distributed Lag Model) by designing a linear

Figure 1: Real Market Value and Standardized Value of Turkish Eurobonds (January 2012-June 2020)



model to test the cointegration relationship. The emergence idea of the ARDL model is that it provides more flexibility compared to the cointegration models introduced previously. The advantage of the model is that it tests both the short and long-term cointegration relationship. In order to estimate a long-term cointegration relationship between variables using the ARDL approach, it is necessary to follow these two steps, respectively. The first step should be to test whether there is a long-term cointegration relationship between all variables. The "Bounds Test" is used to detect this. If a long-term cointegration relationship is determined, the long-run coefficient output created by the ARDL model for independent variables should be examined in the second step. On the other hand, the ARDL model also allows defining the short-term relationship. Via this advantage, the model can be classified as an error correction model.

In the ARDL approach, the dependent variable should be stationary at the first difference, while independent variables should be stationary at the level or the first difference. In contrast, the variables cannot be stationary at the second difference. The lag length is added to this model for both endogenous and exogenous variables, thus eliminating endogeneity problems. In this regard, the model offers consistent and efficient outputs. The lag length for endogenous and exogenous variables can be determined automatically or with information criteria by establishing a VAR model.

Shin et al. (2014) argue that a dependent variable will not react to the negative and positive effects of independent variables at the same scale and propose the NARDL (Nonlinear Autoregressive Distributed Lag Model) approach by following the ARDL methodology. The theoretical and methodological logic to be followed in the NARDL is the same as in ARDL. The difference between them is that positive and negative shocks of independent variables are included in the NARDL model.

In the NARDL approach, the first test for the independent variables' negative and positive components is to check their stationarity levels, as stated above for the ARDL model. If the stationary condition is fulfilled, the step to be followed is to test the existence of a long-term cointegration relationship. Bounds test is applied to test whether the variables cointegrate in the long run. The F-statistic value obtained from the bounds test should be compared with the critical values expressed as the lower limit and the upper limit at different significance levels. The fact that the F-statistic value is higher than the upper limit critical value at the appropriate significance level proves that the variables cointegrate in the long run.

After evidencing the existence of long-run cointegration, the coefficients of the components in both long-run and short-run models can be checked. As stated above, since this approach is based on the error correction model, the error correction term (ECT) should be controlled for the short-run relationship. Accordingly, its coefficient should be statistically significant, its sign should be minus, and the coefficient value should be between 0 and -1. ECT is the value containing the delay of the previous period of error terms in the long-term relationship. It also expresses the extent to which it will correct a short-term imbalance in the long run.

3. RESULTS

3.1. Unit Root Test Results

It is a fundamental rule to test the stationarity of variables in the analysis to be made with time series. We prefer the ADF (Augmented Dickey-Fuller) unit root test, which is frequently used in the literature for this test. The details of the unit root test are reported in Table 2.

Table 2: ADF Unit Root Test Results

	Level										
Variables	TREB	CDS^-	CDS^+	CIH^-	CIH^+	GBD^-	GBD^+	$TUFE^-$	$TUFE^+$	TUR^-	TUR^+
t-statistic	-3.34	-0.16	-0.08	-4.32	-4.27	-0.88	-0.87	-2.30	-0.59	-3.03	-3.03
Probability	0.07	0.99	0.99	**0.00***	**0.00***	0.95	0.95	0.43	0.98	0.13	0.13
	First Difference										
Variables	D TREB	D CDS^-	D CDS^+	D CIH^-	D CIH^+	D GBD^-	D GBD^+	D $TUFE^-$	D $TUFE^+$	D TUR^-	D TUR^+
t-statistic	-9.73	-10.3	-9.72			-8.15	-7.34	-7.94	-5.19	-9.15	-9.70
Probability	**0.00***	**0.00***	**0.00***			**0.00***	**0.00***	**0.00***	**0.00***	**0.00***	**0.00***

Note 1: Schwarz criterion is preferred as the model selection method, and the equation includes trend and intercept.
Note 2: "D" represents the first difference of variable.
Note 3: "*" means that the t-statistic is statistically significant below 5% level.
Note 4: H_0: Variable has a unit root.

Considering the unit root test results in Table 2, the test statistics' probability values for both negative and positive components of the CIH variable are less than a 5% significance level. They do not contain unit root at level ($p<0.05$, $p<0.05$). Other variables become stationary when their first differences are taken. This situation demonstrates that the assumption of becoming stationary at the first difference level of the dependent variable and the independent variables' level or the first difference level is fulfilled.

3.2. Determining Lag Length

Meanwhile, determining the optimal lag length for the endogenous and exogenous variables for the NARDL model can be resolved in the VAR model. Details on this process are presented in Table 3.

Table 3: Determining Lag Length

Lag	Schwarz Information Criterion	Hannan-Quinn Information Criterion
0	14.40397	14.22656
1	**-3.130234***	**-8.978376***
2	-0.187547	-4.267817
3	1.645272	-4.386432
4	4.605944	-3.377193
5	6.339066	-3.595506
6	6.739475	-5.146530
7	4.859063	-5.259071

Note: VAR model allows up to seventh maximum lag.

While determining the optimal lag length in the VAR model, some information criteria are considered. Here we refer to the Schwarz and Hannan-Quinn information criteria. For these information criteria, the number of lags with the smallest value is the optimum lag length. As can be seen from Table 3, the first lag is the optimal lag length.

3.3. Estimating the Most Appropriate NARDL Model

We utilize the Schwarz criterion for choosing the most appropriate model for the NARDL model. Results regarding the estimation of the NARDL model selected according to this criterion are reported in Table 4.

Table 4: NARDL (1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1) Model Estimation Results

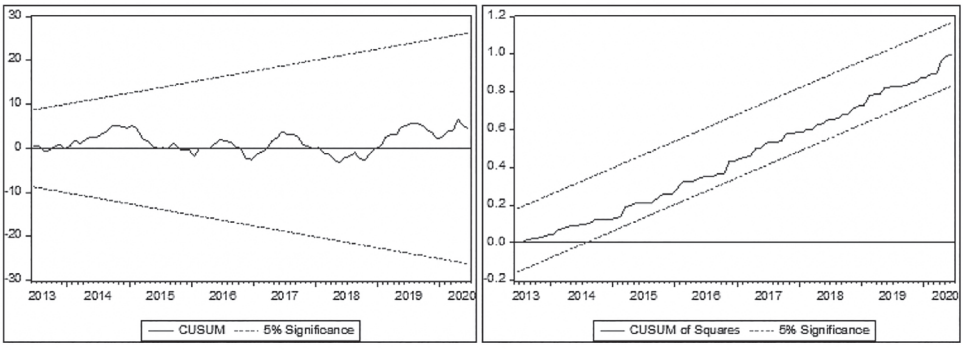
Variables	Coefficients	Standard Error	t-statistic	Probability
TREB [-1]	0.684903	0.066132	10.35660	0.0000
CDS^-	-0.736529	0.086134	-8.550952	0.0000
CDS^- [-1]	0.285077	0.104777	2.720789	0.0079
CDS^+	-0.230451	0.043562	-5.290131	0.0000
TUR^-	0.429995	0.102719	4.186118	0.0001
TUR^- [-1]	-0.514410	0.092761	-5.545518	0.0000
TUR^+	-0.059040	0.042345	-1.394286	0.1669
CIH^-	-0.115822	0.046841	-2.472650	0.0154
CIH^+	-0.073812	0.035790	-2.062352	0.0422
$TUFE^+$	0.337477	0.334438	1.009086	0.3158
$TUFE^-$	-1.735355	1.464600	-1.184867	0.2394
GBD^-	0.008419	0.033797	0.249099	0.8039
GBD^+	-0.002248	0.027930	-0.080496	0.9360
GBD^+ [-1]	-0.071955	0.033145	-2.170887	0.0327
C	-0.783382	0.170151	-4.604037	0.0000
R^2	0.965098	Mean dependent variable		0.045262
Adjusted R^2	0.959350	Standard deviation of dependent variable		0.955809
Standard error of regression	0.192709	Akaike information criterion		-0.31778
Sum squared residual	3.156640	Schwarz information criterion		0.072990
Log likelihood	30.88925	Hannan-Quinn criterion		-0.15963
F-statistic	167.8860	Durbin-Watson statistic		1.968295
Probability (F-statistic)	0.000000			
Note: Schwarz criterion is preferred as the model selection method.				

As shown in Table 4, R^2 and adjusted R^2 with high values indicate that the independent variables are thriving in explaining the dependent variable (96.5%, 95.9%). The F-statistic value suggests the significance of the model as a whole ($p<0.05$). The fact that the Durbin-Watson statistic value is close to 2 is a sign of no autocorrelation problem in the model (1.968).

3.4. Testing Structural Break in the Model

Testing for structural breaks in the predicted model is vital for the reliability of the output results. If structural breaks are observed in the model, a dummy variable should be created for the periods in which they occur. Then it is included in the model. Structural breaks are tried to be removed with the help of the added dummy variable. It can use the CUSUM test developed by Brown et al. (1975) to test structural breaks' presence. Moreover, the CUSUM of Squares test, which measures more precisely than the CUSUM test, may be preferred. Results for both tests are presented in Figure 2.

Figure 2: The Results of CUSUM and CUSUM of Squares Tests



As shown in Figure 2, the curve drawn between two critical boundary lines in both tests does not extend beyond these lines. This result means that there are no structural breaks in the model at the 5% significance level. The results of both CUSUM and CUSUM of Squares tests support this finding.

3.5. Diagnostic Tests

Examination of diagnostic tests in the predicted model is essential in terms of reliability in output results. Results of diagnostic tests are reported in Table 5 below.

Table 5: The Results of Diagnostic Tests

Tests	Probability
Ramsey RESET Test	0.4764
Normality Test	0.6017
Autocorrelation (Breusch-Godfrey Serial Correlation LM Test)	0.9597
Heteroscedasticity (Breusch-Pagan-Godfrey Test)	0.8420

The Ramsey RESET test result shows that the model specification is correct ($p>0.05$). According to the normality test result, the data are normally distributed ($p>0.05$). The result of the Breusch-Godfrey Serial Correlation LM test shows that there is no autocorrelation problem among successive values of the error term ($p>0.05$). According to the Breusch-Pagan-Godfrey test, the error term's variance is homoscedastic ($p>0.05$).

3.6. Bounds Test Results

Whether the variables are cointegrated in the long run is checked with the bounds test. The findings of this test are reported in Table 6 below.

Table 6: NARDL (1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1) Bounds Test Results

F-statistic value	4.195	Number of Independent Variable (k)
		10
Critical Boundary Values		
Significance Levels	**I0 (Lower bound)**	**I1 (Upper bound)**
10%	1.76	2.77
5%	1.98	**3.04***

Note 1: "*" means that the t-statistic is statistically significant below 5% level.

Note 2: H_0: There is no long-run cointegration relationship.

As can be understood from Table 6, the F-statistic value is greater than the upper bound's critical value at a 5% significance level (4.195>3.04). In this case, the null hypothesis is rejected. It is concluded that the variables are cointegrated in the long run. The long-run cointegration relationship among the series is proved. It can be passed to analyze the short and long-run coefficients, respectively. The results of the short-run coefficients are shown in Table 7.

Table 7: The Short-Run Results of the NARDL Model (1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1)

Variables	Coefficient	Standard Error	t-statistic	Probability
$D(CDS^-)$	-0.841548	0.096398	-8.729968	**0.0000***
$D(CDS^+)$	-0.204731	0.057135	-3.583251	**0.0006***
$D(TUR^-)$	0.385750	0.082424	4.680060	**0.0000***
$D(TUR^+)$	-0.047729	0.093527	-0.510319	0.6112
$D(CIH^-)$	-0.085784	0.048288	-1.776507	0.0792
$D(CIH^+)$	-0.036455	0.045017	-0.809805	0.4203
$D(TUFE^+)$	-0.416160	0.587556	-0.708290	0.4807
$D(TUFE^-)$	-1.252720	2.243903	-0.558277	0.5781
$D(GBD^-)$	0.012455	0.024138	0.515965	0.6072
$D(GBD^+)$	-0.007852	0.025544	-0.307368	0.7593
ECT(-1)	-0.354778	0.056833	-6.242425	**0.0000***

Note: "*" means that the t-statistic is statistically significant below the 5% level.

When the model results are observed, the sign of ECT is minus, its value is between 0 and -1, and the coefficient is statistically significant ($p<0.05$). If any shock occurs, the imbalance between the short and long term will recover by about 35% in the next period. The short-term coefficients display that CDS^-, CDS^+ and TUR^- are statistically significant ($p<0.05$, $p<0.05$, $p<0.05$). Ceteris paribus, a 1% decrease in CDS increases TREB by approximately 0.84%, and a 1% increase in CDS decreases TREB by approximately 0.20%. Therefore, both negative and positive shock of CDS affects TREB. However, the negative shock affects TREB

more than the positive shock in the short term. Also, a 1% decrease in TUR decreases TREB by approximately 0.38%, while the positive shock of TUR does not affect TREB in the short term.

After the short-term estimation, details about the long-term relationship between TREB and independent variables are reported in Table 8.

Table 8: The Long-Run Results of the NARDL Model (1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1)

Variables	Coefficient	Standard Error	t-statistic	Probability
CDS^-	-1.432740	0.233057	-6.147597	**0.0000***
CDS^+	-0.731366	0.190347	-3.842273	**0.0002***
TUR^-	-0.267899	0.319909	-0.837423	0.4047
TUR^+	-0.187372	0.133222	-1.406463	0.1632
CIH^-	-0.367575	0.143790	-2.556326	**0.0124***
CIH^+	-0.234250	0.129632	-1.807039	0.0743
$TUFE^+$	1.071025	1.175039	0.911480	0.3646
$TUFE^-$	-5.507370	4.845378	-1.136623	0.2589
GBD^-	0.026718	0.106706	0.250388	0.8029
GBD^+	-0.235493	0.141806	-1.660674	0.1005
Constant term	-2.486162	0.286956	-8.663908	**0.0000***

Note: "*" means that the t-statistic is statistically significant below the 5% level.

CDS^-, CDS^+ and CIH^- are statistically significant as per the results of the long-term model ($p<0.05$, $p<0.05$, $p<0.05$). Ceteris paribus, a 1% decrease in CDS increases TREB by approximately 1.43%, and a 1% increase in CDS decreases TREB by approximately 0.73%. In that case, both negative and positive shock of CDS affects TREB. In contrast, the negative shock affects TREB more than the positive shock in the long term as in the short term. Furthermore, while a 1% decrease in CIH increases TREB by approximately 0.37%, the positive shock of CIH does not affect TREB in the long term.

4. DISCUSSION

In addition to the bond issuance cost of countries, the leading factor determining the bond's return to the investor is the risk premium exposed in the eurobond markets. A lender who buys bonds pays a specific cost price to eliminate his receivable default risk, which qualifies as a risk premium. If the default risk, one of the "eight forces influencing return on investment" principles emphasized by Adedeji and McCosh (1995), increases, the return will increase. A rise in the default risk also increases the risk premium. Since the CDS measures the default risk of government bonds issued in international markets, the market value of the eurobonds also primarily depends on the CDS.

Regarding the study's findings, the effects of decreases and increases in CDS on the eurobond market value are different from each other. Buket (2009) defends that Turkish eurobond issues decrease in periods of crisis. His view also supports our finding related to CDS. Since it is a known fact that CDS rises in periods of turmoil or disaster, bond issue cost increases accordingly. In similar periods, Turkey will be reluctant to issue eurobonds. Thus, TREB will decrease.

On the other hand, the fact that bond issuance cost is low during low CDS periods (negative shock) will encourage the Turkish government to issue eurobonds. In this case, TREB will increase. By comparison, the effect of CDS' negative shock to increase TREB is greater than the impact of CDS' positive shock to reduce it both in the long and short run.

Governments aim to increase their international reserves by issuing eurobonds. Hence, another variable affecting the market value of Turkish eurobonds is TUR. Min et al. (2003), who separate the variables affecting the bond yield margin into three categories, state that the international reserve is included in the group with country-specific variables. Buket (2009) concludes that the ratio of international reserves to GDP significantly affects its risk premium. Additionally, Edwards (1984) suggests that international funds are negatively associated with the country's risk premium. In our research, we conclude that a negative shock in TUR reduces TREB in the short term. This situation is since the risk premium will increase with a negative shock in TUR, and TREB will decrease accordingly. Our finding also coincides with the literature in this aspect. On the other hand, an increase in TUR does not significantly affect TREB in the short term.

Another reason why governments tend to eurobond markets is to maintain their current account balances. One of the ways preferred by Turkish governments to finance its current account deficit, which it has been struggling with for many years, is to issue eurobonds in international markets.

Amira (2004) emphasized that the current account is a country-specific macro indicator while determining the factors affecting the eurobond yield margins. Similarly, Min et al. (2003) discuss the current account in the country-specific variables. According to our findings, the decrease in CIH increases TREB in the long term. As the current account deficit decreases, the country risk premium will fall, and therefore the cost of issuing eurobonds will decrease. This situation will increase TREB in the long term.

Contrary to the significant and positive relationship between inflation and bond return, which is frequently emphasized in the relevant literature (Fisher, 1959; Min, 1999; Min et al., 2003; Amira, 2004; Senga et al., 2018), one of the striking findings is that TUFE does not affect TREB in both short and long term. Simultaneously, unlike Amira (2004) and Maltritz (2012), who argue that the budget balance significantly affects the government bond returns, there is no significant effect of GBD on TREB in the short and long term.

CONCLUSION

In this study, country-specific factors affecting the market value of eurobonds issued by the Turkish government are investigated. In this direction, 102-monthly time-series data from January 2012 to June 2020 are tested with the NARDL model. As a result of the study, it is detected that the significant variable determining TREB is CDS in both the short and long term, in line with the literature. However, it should be noted that TREB's response to the negative shock of CDS is more significant than its response to positive shock. Moreover, the negative shock of TUR in the short term and the negative shock of CIH in the long term have a significant effect on TREB. While a negative shock in TUR decreases TREB in the short term, a negative shock in CIH increases TREB in the long term.

There are not many studies aimed at determining the eurobond market value. Our study findings need to be supported by complementary studies tested with different asymmetric techniques. It will be healthier to compare Turkey's results with the findings of studies involving developing countries with similar characteristics.

TÜRK AVROVİLLERİNİN PİYASA DEĞERİNİ ETKİLEYEN ÜLKEYE ÖZGÜ DEĞİŞKENLERİN BELİRLENMESİ: NARDL YAKLAŞIMI

1. GİRİŞ

Bu çalışma, T.C. Hazine ve Maliye Bakanlığı tarafından ihraç edilen avrovillerin piyasa değerini etkileyen ülkeye özgü faktörleri belirlemeyi amaçlamaktadır. Çalışmanın literatüre katkısı üç noktada değerlendirilebilir. İlk olarak, avrovil piyasa değerini etkileyen değişkenlerin belirlenmesi, yatırımcılar açısından dikkat etmeleri gereken göstergeleri ortaya koymakta; devlet açısından ise dış kaynak yaratırken sermaye maliyetlerini etkileyen değişkenleri ortaya çıkarmaktadır. İkinci olarak, literatürde nispeten sık kullanılan simetrik modellerden farklı olarak asimetrik model kullanılması, modele negatif ve pozitif şoklar dahil ederek daha geniş bilgi elde etme imkanı sunmaktadır. Negatif ve pozitif şokların bağımlı bir değişken üzerinde aynı etkiye sahip olmayacağı argümanına dayanarak, farklı şokların etkisi ölçülebilmekte ve etki güçleri karşılaştırılabilmektedir. Üçüncüsü, ulusal literatürde çeşitli menkul kıymetler için sık sık araştırmalar yapılmasına rağmen, avroviller üzerinde çok az çalışma yapıldığı gözlemlenmiştir. Bu açıdan araştırma özgünlük içermekte ve literatüre katkı sağlamaktadır.

2. METODOLOJİ

Bu araştırmada Türk avrovil piyasa değerini etkileyeceği düşünülen ülkeye özgü faktörler, ilgili literatür taranarak belirlenmiştir. Değişkenlerin veri seti oluşturulurken mümkün olan

en geniş zaman aralığının incelenmesi amaçlanmıştır. Buna göre Ocak 2012'den Haziran 2020'ye kadar olan 102 aylık zaman serisi verileri analiz edilmiştir.

ARDL modeli, önceki eşbütünleşme modellerine göre daha fazla esneklik sağlamaktadır. Bu model, kısa ve uzun dönemli eşbütünleşme ilişkilerini test etmektedir. ARDL metodolojisini takip eden Shin vd. (2014), bağımlı bir değişkenin bağımsız değişkenlerin negatif ve pozitif şoklarına aynı ölçekte yanıt vermeyeceğini savunarak NARDL (Doğrusal Olmayan Otoregresif Dağıtılmış Gecikme Modeli) yaklaşımını önermiştir. NARDL yaklaşımında izlenecek teorik ve metodolojik mantık, ARDL ile aynıdır. NARDL yaklaşımındaki tek fark, bağımsız değişkenlerin pozitif ve negatif şoklarının modele dâhil edilmesidir.

3. BULGULAR

Değişkenlerin uzun dönemde eşbütünleşik hareket edip etmedikleri Sınır Testi yardımıyla kontrol edilmiştir. Testin "uzun dönemli eşbütünleşik ilişki yoktur" boş hipotezi reddedilmiş ve değişkenlerin uzun dönemde eşbütünleşik hareket ettiği sonucuna varılmıştır. Seriler arasındaki uzun dönemli eşbütünleşme ilişkisi ispatlandığı için sırasıyla kısa ve uzun dönem katsayılarının incelenmesine geçilmiştir.

Kısa süreli ilişkiyi ifade eden modelin sonuçlarına göre, ECT katsayısının işareti negatif, değeri 0 ile -1 arasında ve katsayısı istatistiksel olarak anlamlıdır ($p<0,05$). Buna göre bir şok durumunda kısa ve uzun dönemde oluşacak dengesizlik bir sonraki dönemde yaklaşık %35 oranında giderilecektir. Kısa dönem katsayıları incelendiğinde, diğer tüm değişkenler sabitken, CDS^-, CDS^+ ve TUR^- katsayıları istatistiksel olarak anlamlıdır ($p<0,05$; $p<0,05$; $p<0,05$). Buna göre, diğer tüm değişkenler sabitken, CDS'deki %1'lik bir azalma, TREB'yi yaklaşık %0,84 oranında artıracak ve CDS'deki %1'lik bir artış, TREB'yi yaklaşık %0,20 oranında azaltacaktır. Bu sonuca göre, CDS'nin hem negatif hem de pozitif şoku TREB'yi etkilemektedir. Bununla birlikte, CDS'nin olumsuz şoku, kısa vadede TREB'yi daha fazla etkilemektedir. Ayrıca, TUR'deki %1'lik bir azalma, TREB'yi yaklaşık %0,38 oranında azaltırken, TUR'nin pozitif şoku kısa vadede TREB'yi etkilememektedir.

Uzun süreli ilişkiyi ifade eden modelin sonuçlarına göre, CDS^-, CDS^+ ve CIH^- değişkenleri istatistiksel olarak anlamlıdır ($p<0,05$; $p<0,05$; $p<0,05$). Buna göre, diğer tüm değişkenler sabitken, CDS'deki %1'lik bir azalma, TREB'yi yaklaşık %1,43 oranında artıracak ve CDS'deki %1'lik bir artış, TREB'yi yaklaşık %0,73 oranında azaltacaktır. Bu sonuca göre, CDS'nin hem negatif hem de pozitif şoku TREB'yi etkilemektedir. Ancak, CDS'nin negatif şoku TREB'yi kısa vadede olduğu gibi uzun vadede daha fazla etkilemektedir. Ayrıca, CIH'deki %1'lik bir azalma TREB'yi yaklaşık %0,37 artırırken, CIH'nin pozitif şoku uzun vadede TREB'yi etkilememektedir.

4. TARTIŞMA

Çalışmanın bulgularına göre, CDS'deki düşüş ve artışların avrovil piyasa değeri üzerindeki etkileri birbirinden farklıdır. CDS'nin yüksek olduğu dönemlerde (pozitif şok) TREB azalmaktadır. Buket (2009)'in bulguları, kriz dönemlerinde Türkiye'nin avrovil ihraçlarının azaldığını göstermektedir. Bu durum çalışma bulgularımızı da destekler niteliktedir. Şöyle ki, kriz ya da olağanüstü dönemlerde CDS'nin arttığı bilinen bir gerçek olduğu için avrovil ihraç maliyeti de buna bağlı olarak yüksek olacaktır. Bu dönemlerde Türkiye avrovil ihraç etmekte isteksiz olacaktır. Böylece TREB azalacaktır.

Öte yandan, düşük CDS dönemlerinde (negatif şok), ihraç maliyetlerinin düşük olması Türkiye'yi avrovil ihraç etmeye teşvik edecektir. Bu durumda TREB artacaktır. CDS'nin pozitif ve negatif şokları karşılaştırıldığında, negatif şokun TREB'yi artırıcı etkisi, hem uzun vadede hem de kısa vadede pozitif şokun TREB'yi azaltıcı etkisinden daha büyüktür.

Ek olarak, TUR'deki negatif bir şokun kısa vadede TREB'yi azalttığı görülmektedir. Bu durumun nedeni, TUR'deki negatif bir şok ile birlikte risk priminin artması ve buna bağlı olarak TREB'nin azalmasıdır. Bu bulgu, bu yönüyle literatürle de örtüşmektedir. Diğer taraftan, TUR'deki artışın kısa vadede TREB üzerinde önemli bir etkisi yoktur.

CIH'deki azalma uzun vadede TREB'yi artırmaktadır. Cari açık azaldıkça ülke risk primi düşecek ve bu nedenle avrovil ihraç etmenin maliyeti düşecektir. Bu durum uzun vadede TREB'yi artıracaktır.

İlgili literatürdeki enflasyon ile avrovil getirisi arasındaki anlamlı ve pozitif ilişkinin aksine (Fisher, 1959; Min, 1999; Min vd., 2003; Amira, 2004; Senga vd., 2018) çalışmamızdaki çarpıcı bulgulardan biri, TUFE'nin hem kısa hem de uzun vadede TREB'yi etkilememesidir. Bütçe dengesinin devlet tahvillerini önemli ölçüde etkilediğini savunan Amira (2004) ve Maltritz'in (2012) de aksine, GBD değişkeninin uzun ve kısa vadede TREB üzerinde anlamlı bir etkisi bulunmamaktadır.

SONUÇ

Çalışma sonucunda hem kısa hem de uzun dönemde TREB'yi belirleyen anlamlı değişkenin CDS olduğu tespit edilmiştir. Bununla birlikte, TREB'nin CDS'nin olumsuz şokuna verdiği yanıtın, pozitif şokuna verdiği yanıttan daha anlamlı olduğu belirtilmelidir. Ayrıca kısa vadede TUR'nin olumsuz şoku ve uzun vadede CIH'nin olumsuz şoku TREB üzerinde anlamlı bir etkiye sahiptir. TUR'deki negatif bir şok kısa vadede TREB'yi azaltırken, CIH'deki negatif bir şok uzun vadede TREB'yi artırır.

Sonuç olarak, avrovil piyasa değerini belirlemeye yönelik çok fazla çalışma bulunmadığından, çalışmanın bulgularının farklı asimetrik tekniklerle incelenen tamamlayıcı çalışmalarla

desteklenmesi gerekmektedir. Gelişmiş ve gelişmekte olan ülkeler için yapılan çalışmalarda farklı bulgular elde edilebileceğinden, Türkiye için elde edilen bulguların benzer özelliklere sahip gelişmekte olan ülkeleri kapsayan çalışmaların bulguları ile karşılaştırılmasında fayda vardır.

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Tasarım / *Design*	Yöntemi, ölçeği ve deseni tasarlamak / *Designing method, scale and pattern*	Fatih YİĞİT İsmail CANÖZ
Veri Toplama ve İşleme / *Data Collecting and Processing*	Verileri toplamak, düzenlenmek ve raporlamak / *Collecting, organizing and reporting data*	Fatih YİĞİT İsmail CANÖZ
Tartışma ve Yorum / *Discussion and Interpretation*	Bulguların değerlendirilmesinde ve sonuçlandırılmasında sorumluluk almak / *Taking responsibility in evaluating and finalizing the findings*	Fatih YİĞİT İsmail CANÖZ
Literatür Taraması / *Literature Review*	Çalışma için gerekli literatürü taramak / *Review the literature required for the study*	Fatih YİĞİT İsmail CANÖZ