

Sustainability of public debt: An example of selected European Union countries

Kamu borcunun sürdürülebilirliği: Seçilmiş Avrupa Birliği ülkeleri örneği

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ABSTRACT

The 2008 Mortgage crisis that emerged in the United States affected almost all countries in the world. Following this effect, a new crisis, namely the debt crisis, appeared in Europe. Greece, Spain, Italy, Ireland, and Portugal have been most strongly affected by this crisis. As a consequence of the 2008 global financial crisis, the sustainability of increasing public debt has been a matter of debate. Within this context, in the study, the sustainability of public debt for the European Union countries with the highest public debt was examined with the help of different unit root tests using the annual data of 1995–2018. Based on the results of the study, public debt in the investigated countries was found to be sustainable.

Keywords: EU countries, panel data analysis, public debt, sustainability

JEL Codes: H60, H61, E6

ÖZ

2008 yılında Avrupa Birliğinde meydana gelen Mortgage krizi dünyanın hemen hemen bütün ülkelerinde etkisini göstermiştir. Bu etkiyle birlikte Avrupa'da borç krizi adıyla yeni bir kriz patlak vermiştir. Bu krizden en fazla etkilenen ülkeler ise Yunanistan, İspanya, İtalya, İrlanda ve Portekiz olmuştur. Dolayısıyla 2008 küresel finansal krizinden sonra artan kamu borçlarının mali sürdürülebilirlik tartışmaları artmıştır. Bu bağlamda çalışmada kamu borcunun en fazla olduğu Avrupa Birliği ülkeleri için kamu borcunun sürdürülebilirliği 1995–2018 yıllık verileri kullanılarak yapısal kırılmalı ve yapısal kırılmasız panel birim kök testi yardımıyla incelenmiştir. Çalışma sonucunda kamu borcunun seçilen bu ülkelerde sürdürülemez olduğu tespit edilmiştir.

Anahtar Kelimeler: AB ülkeleri, panel veri analizi, kamu borcu, sürdürülebilirlik

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Introduction

With the introduction of the euro in 2002, loans have become cheaper for the countries included in the euro area. As a result, public and private sector expenses increased, and many European countries (especially Greece, Italy, and Portugal) entered into a crisis with high debt rates. In addition, competition in these countries has decreased and growth based on debt has been adopted. On the other hand, the disruptions that came with the financial crisis in the banking system brought a new burden on the public. With the increase in public risk and loan costs, the debt crisis has become unsustainable. Although the Mortgage crisis arising in the United States was initially expected to be regional, because of the relations between the United States and Europe, the crisis occurred in almost every country in Europe. The crisis, which originated with the bankruptcy of several major banks in the United States, led to a decline in production and national income and also significantly hindered foreign trade transactions with Europe. A debt crisis broke out in Europe due to a decline in the stock markets followed by issues in the banking sector and liquidity distress as well as high public debt and current deficit. However, it would not be accurate to claim that the European debt crisis was caused solely by the global crisis. Financial distress has intensified in European countries due to

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the emergence of the global crisis on top of national economic and financial problems. Europe has diverged negatively from the global economy. Due to the nationalization of the debts of some financial institutions, the public debt has risen to serious levels and this has led to concerns about the repayment of the debt. Expropriation of debts of some financial institutions caused public debt to rise to serious levels and concerns about repayment of this debt. This resulted in countries such as Greece, Ireland, Portugal, and Spain, which have high debt, to face the debt problem. The crisis experienced in European countries is remarkable with regard to existing economic differences in the center and periphery groups of countries. As for Germany and France, located in the center of Europe, it is possible to say that their significant influence on European Union (EU) politics compared to the peripheral countries has resulted in a greater economic difference between central and peripheral EU countries. The impact of the crisis was experienced deeply in Greece, Ireland, Portugal, and Italy in particular (Beşer & Kılıç, 2019).

Figure 1 shows the proportions of public debt in countries most significantly affected by the global economic crisis. As demonstrated in the figure, following the crisis, proportions of public debt appear to be ever increasing in almost all of the countries mentioned.

Figure 1 presents the share of public debt in gross domestic product (GDP) in selected European countries. As seen in the figure, following the global financial crisis, public debt appears to rise continually. Particularly in Ireland and Spain, where the share of public debt in GDP was below 50% prior to the global crisis, this share was much higher following the crisis, even surpassing 100% in Ireland after 2011.

As for the aforementioned countries, it would be fair to say that they all have been affected by the global crisis in varying degrees. Greece has felt the impact of the crisis most strongly and imposed the greatest burden on the EU. The Greek crisis is also considered to be among the most significant debt crises. Expansionary fiscal policies undertaken in Greece have led to fiscal and macroeconomic imbalances. High public expenditures, weak public revenue, and structural issues resulted in weak international competitive power (Durusoy & Şamiloğlu, 2012). As for the economy of Greece, increased social security expenditures in particular, as well as decreasing tax revenues and high prices, negatively influenced the public finance performance (Uçar, 2012). Unsustainable public debt overlapping with the global financial crisis has increased the magnitude of the crisis.

Another country that battled with high public debt was Ireland. The crisis appeared in Ireland as a result of increases in

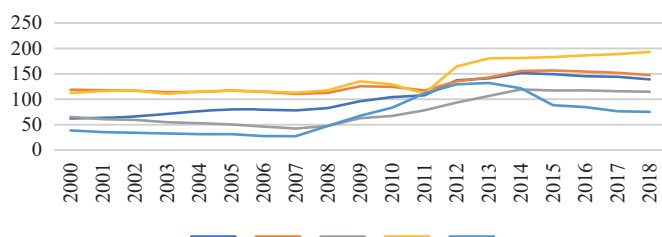


Figure 1. Some European Countries Public Debt (Gross Domestic Product %). Source: Eurostat, <https://ec.europa.eu/eurostat/data/database>, 2019.

government debt stock and budgetary deficits on top of hardships in housing and banking industries. The hardship in the housing industry adversely affected the construction industry and hindered growth. The economy of Ireland downsized by 7% in the last quarter of 2008 and 6% in the first quarter of 2009, following negative growth in the first quarter of 2008 (Yılmaz, 2013).

Overall, it can be seen that the European crisis takes its source from structural circumstances and the challenges in the economic coordination. There are significant differences between levels of development and competitive economic power of Eurozone countries (Kılıç & Bayar, 2013). Despite varying financial and economic problems, a common issue to all of these countries is public debt. Within this context, the present study examines the sustainability of public debt in European countries.

The paper proceeds as follows. In the second section, public debt sustainability and financial sustainability studies are included. In the third section, data and methodology are described. For this purpose, Hadri and Kurozumi (2012) test, which is one of the second-generation unit root tests that primarily takes into account the cross-sectional dependence, and Im et al. (2005) structural break panel unit root test, which both allows for structural breaks and assumes cross-section dependence with the trend shift Lagrange Multiplier (LM) test, will be applied. The results of the study are given in the last section.

Survey of the Literature

As a result of the literature review, it is seen that Hamilton and Flavin (1986) and Trehan and Walsh (1991) made the first studies examining the sustainability of budget policies using stagnation analyses. In the univariate approach introduced by Hamilton and Flavin (1986), budget policies are sustainable if the variable obtained is the result of the ratio of the public debt stock to the GDP; if it does not meet the stationarity condition, it means that it is not sustainable.

According to Trehan and Walsh (1991), it is sufficient for public debt to be stationary in the first difference in order to assume sustainability. A definition of fiscal sustainability is given by Burnside (2005) as "a government's ability to indefinitely maintain the same set of policies while remaining solvent." However, there is no single clear definition of the concept in the literature. It is, according to Buiters (1983), the stability in the ratio of net fiscal deficit value to GDP. Broda and Weinstein (2004) defined fiscal sustainability as public sector borrowing requirement, the primary surplus and public debt stock to GDP ratio have been defined as stagnant, current policies can be maintained with a stable debt/GDP ratio. According to Blanchard et al. (1991), fiscal sustainability is the ultimate convergence of public debt/GDP ratio to the initial level and the equality between present values of future primary surplus and current deficit. Alvarado et al. (2004) define fiscal sustainability as the long-term stability of fiscal policy implemented by the state. Another test for sustainability proposed by Bohn (1995) suggests that a given public debt policy can be shown to be sustainable in case the primary surplus/GDP ratio is a positive function of the debt/GDP ratio.

Sensitivity toward fiscal policy against increasing public debt and changing macroeconomic conditions has increased, and different views have been put forward in economic debates. Joseph (2008)

conducted an analysis of East Caribbean countries for the years 1970–2005 and concluded the absence of fiscal sustainability. Ehrhart and Llorca (2008) investigated South Mediterranean countries for the time periods from 1975 to 1999 and from 1976 to 1999 using unit root tests, and their results showed the presence of long-term fiscal sustainability in the studied countries. Ono (2008) found fiscal sustainability to be present in all countries except Japan in their study of G-7 countries. Hauner et al. (2007), on the other hand, documented fiscal sustainability in all G-7 countries. In their study, Mendoza and Oviedo (2004) established fiscal sustainability in Mexico. Croce and Ramon (2003) conducted a fiscal sustainability study involving several countries and concluded that there was no fiscal sustainability in Turkey, Argentina, and Brazil in the 1990s, whereas it was present in Indonesia, Ireland, and Mexico. Vural (2018) failed to obtain a significant result in his study of Turkey for 2006:1–2016:2. Dökmen and Boz (2017) examined fiscal sustainability in Turkey based on quarterly data of 2004:3 and 2016:2 and concluded the absence of fiscal sustainability in Turkey. Tekeli and Hotunoğlu (2014) based their study on annual data from 1975 to 2012 to investigate fiscal sustainability in Turkey and found no indication of powerful fiscal sustainability. According to Bohn (1998), fiscal consolidation appeared as a way to restore fiscal sustainability in the case of a rapidly rising public debt level. There is an extensive number of studies in the literature demonstrating the use of fiscal space functions in fiscal sustainability analysis. Lukkezen and Rojas-Romagosa (2013), Medeiros (2012), Burger et al. (2012), Celasun et al. (2006), Fournier and Fall (2015) used fiscal space functions to estimate the thresholds for the sustainability of public debt and the limits of public debt. Beqiraj et al. (2018) examined the sustainability of public debt in 21 OECD countries based on annual data from 1991 to 2015 and found out that public debt in these countries was unsustainable.

Method

Although every country has different financial and economic problems, the common problem of the countries is public debt. This article is based on the study by Hamilton and Flavin (1986) and Trehan and Walsh (1991) basing the sustainability of budget policies on stagnation analyses. There are many studies in this context in the literature. Most of the studies in the literature consist of the relationship between economic growth and public debt. This study aims to examine the sustainability of public debt in some EU countries. In this study, researchers investigated the sustainability of public debt in selected countries based on annual data from 1995 to 2018. In the study, the Debt/GDP variable (used as public debt), which is the ratio of the total public debt stock to the GDP, was used as a sustainability indicator. Debt/GDP data for Italy, Spain, Portugal, Greece, and Ireland were subject to analysis. The data were obtained from the Eurostat databank. Although there is no generally accepted level regarding the level of debt stock, today, the ratio of Debt/GDP is a frequently preferred indicator in terms of giving an idea about the sustainability of debts. The best-known example of this is Maastricht criteria. Accordingly, 60% is determined as the upper limit for the ratio of public debt stock to GDP in the member countries of the Euro Area. The discussed variables were first tested for cross-sectional dependence to allow for the application of unit root tests taking account of cross-sectional dependence. It would be unrealistic to assume that the cross-section units in the panel are not influenced by one another in the presence of a shock on the series. It is necessary to apply unit root tests taking account

of cross-sectional dependence to obtain effective estimation results (Nazlıoğlu, 2010).

In panel data analysis, it is first and foremost necessary to test cross-sectional dependence. This is due to the fact that unit root tests used to test the stationarity of series differ based on whether cross-sectional dependence is present in series. First-generation unit root tests are based upon the assumption that there is no correlation between cross-section units and are used in the case when there is no cross-sectional dependence. However, in the case of a correlation between cross-section units, first-generation tests have lower strength. For this reason, second-generation unit root tests that account for cross-sectional dependence were developed (Yerdelen & Tatoğlu, 2013). The first test developed to examine the existence of cross-sectional dependence in series in panel data analysis is the LM test developed by Breusch and Pagan. Lagrange Multiplier test is used when the time dimension of panel data is greater than the cross-sectional dimension ($T > N$). The test statistics ($CDLM_1$) of LM test are as follows (Pesaran, 2004).

Breusch and Pagan's (1980) LM_{BP} test statistics were used to test for cross-sectional dependence. LM_{BP} test statistics are calculated based on the regression given in the following equation:

$$CDLM_1 = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \quad (1)$$

$\hat{\rho}_{ij}^2$ given in Equation (1) is the estimation of the pairwise correlation of the residuals. Breusch and Pagan indicated that in the case of null hypothesis where no cross-sectional dependence presents, $CDLM_1$ test statistics is distributed asymptotically (χ^2). Besides, the applicability of the LM test diminishes in the case of $N \rightarrow \infty$. Following this, Pesaran developed a new test to be used in the case where N and T are of large values. Test statistics of this test ($CDLM_2$) is the scaled version of $CDLM_1$ (Pesaran, 2004):

$$CDLM_2 = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T \hat{\rho}_{ij}^2 - 1) \quad (2)$$

Pesaran et al. later developed a different version of the LM test. Bias-adjusted LM statistics of this test (LM_{adj}) is as follows (Pan et al., 2015):

$$LM_{adj} = \sqrt{\left(\frac{2T}{N(N-1)} \right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \frac{(T-k) \hat{\rho}_{ij}^2 - \mu_{Tij}}{\sqrt{V_{Tij}^2}} \quad (3)$$

In this study, cross-section dependence was determined in the series. First of all, the Hadri and Kuruzomi (2012) test was applied in the study. Then, the Im et al. (2005) structural break panel unit root test, which allows for structural breaks and assumes cross-section dependence with the trend shift LM test, was applied Im et al. (2012). Lagrange Multiplier test developed by Im et al. (2010) allows up to two heterogeneous breaks both in level and in slope. Besides, the test corrects the existence of cross-section dependence by applying the extended process (CA) in terms of cross-section developed by Pesaran (2007) (Özcan, 2012). In addition, the test allows for breaks at different times for different countries and structural breaks in both null and alternative hypotheses.

The Hadri-Kuruzomi (2012) test was developed to be the panel test equivalent of the KPSS (Public Personnel Selection Examination) test in time series while also taking account of cross-sectional dependence. Test statistics are calculated as follows:

$$Z_A^{SPC} = \frac{1}{\hat{\sigma}_{iSPC}^2 T^2} \sum_{t=1}^T (S_{it}^W)^2 \tag{4}$$

$$Z_A^{LA} = \frac{1}{\hat{\sigma}_{iLA}^2 T^2} \sum_{t=1}^T (S_{it}^W)^2 \tag{5}$$

Null and alternative hypotheses for the Hadri-Kuruzomi test are expressed as follows (Hadri & Kuruzomi, 2012):

$H_0 : \theta_i \neq 0$: Series are stationary.

$H_1 : \theta_i = 0$: Series are not stationary.

Since the first- and second-generation tests do not allow for structural breaks, they might be subject to a significant loss of power in case of possible breaks in data. For this reason, LM panel unit root test by Im et al. (2005) is recommended. Im et al. (2005) suggested a panel LM t -statistic based on univariate LM statistics (Lee & Strazicich, 2003). Lee and Strazicich's model can be summarized as follows:

$$\Delta Y_{i,t} = \delta_i \Delta Z_{i,t} + \delta_i \hat{S}_{i,t-1} + \varepsilon_{i,t} \tag{6}$$

where Δ is the first difference operator, $\hat{S}_{i,t-1}$ is the detrended variable of $Y_{i,t-1}$, and $\varepsilon_{i,t}$ denotes error term. The t -statistic (denoted \bar{t}) for the null hypothesis $H_0 : \delta_0 = 0$ can be calculated for individual units to compute LM test statistic as follows:

$$\bar{t} = \frac{1}{N} \sum_{i=1}^N \bar{t}_i^* \tag{7}$$

This is then used to determine the following standardized panel LM test statistics:

$$LM(\bar{t}) = \frac{\sqrt{N}(\bar{t} - E(\bar{t}))}{\sqrt{V(\bar{t})}} \tag{8}$$

where $E(\bar{t})$ and $V(\bar{t})$ are tabulated by Im et al. (2005).

Fourier Panel KPSS test based on the Fourier KPSS stationarity test suggested by Nazloğlu and Karul (2017) and developed by Becker et al. (2006) is as follows:

$$y_{it} = \alpha_i(t) + r_{it} + \lambda_i F_t + \varepsilon_{it} \tag{9}$$

$$r_{it} = r_{i,t-1} + u_{it} \tag{10}$$

where $i=1,2,3, \dots, N$ cross-sectional dimension, $t=1,2,3, \dots, T$ time dimension, $r_{i0}=0$ starting point, r_{it} random walk process, ε_{it} and u_{it} mutually independent and identically distributed stands for constant variance error terms. F_t is stationary and $EF_t^2 = \sigma_{F_t}^2 > 0$ is the uncorrelated unobservable common factor. ε_{it} , F_t , and λ_i are independently distributed for all i s. Finally, F_t is assumed

to be known. $\alpha_i(t)$ is a deterministic function of t . Regardless of whether the breaks in the series are sharp or soft, the number of breaks and the dates of the break, nonlinear, or any break in the deterministic term can be captured with the Fourier approach (Becker et al., 2006).

According to Enders and Lee (2012), if the constant term contains any structural shift with unknown forms, the Fourier expansion with a single frequency component can be expressed as:

$$\alpha_i(t) = \alpha_i + \gamma_{1i} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2i} \cos\left(\frac{2\pi kt}{T}\right) \tag{11}$$

γ_{1i} and γ_{2i} measure the width and displacement of structural shifts, respectively. k represents the Fourier frequency number. The above equation shows smooth shifts in the constant term.

It allows obtaining the time-varying constant term with nonzero values of γ_{1i} and γ_{2i} to capture (Jones & Enders, 2014):

$$\alpha_i(t) = \alpha_i + b_{it} + \gamma_{1i} \sin\left(\frac{2\pi kt}{T}\right) + \gamma_{2i} \cos\left(\frac{2\pi kt}{T}\right) \tag{12}$$

In the above equation, both the slope of the deterministic trend and any change in the constant term can be captured with the non-zero values of γ_{1i} and γ_{2i} which show the soft shift in the trend function (Lee et al., 2015).

The hypotheses of this test are as follows:

$H_0 = \sigma_{iit}^2 = 0$ is stationary.

$H_1 = \sigma_{iit}^2 > 0$ is not stationary.

Becker et al. (2006)'s KPSS-based stationarity test, which allows the Fourier frequency, can be expressed as follows:

$$\eta_i(k) = \frac{1}{T^2} \frac{\sum_{t=1}^T \tilde{S}_{it}(k)^2}{\hat{\sigma}_{\varepsilon_t}^2} \tag{13}$$

Here $\tilde{S}_{it}(k) = \sum_{j=1}^t \tilde{\varepsilon}_{it}$ denotes the partial sum of the residues obtained from the LLC (Life Cycle Cost) estimate of Equation (10) and $\hat{\sigma}_{\varepsilon_t}^2$ is the estimation of the long-run variance of the ε_{it} error term:

$$\sigma_{\varepsilon_t}^2 = \lim_{T \rightarrow \infty} T^{-1} E(S_{it}^2) \tag{14}$$

The Fourier panel statistic $FP(k)$ can be defined as:

$$FP(k) = \frac{1}{N} \sum_{i=1}^N \eta_i(k) \tag{15}$$

Nazloğlu and Karul (2017) following Becker et al. (2006) showed that the asymptotic distribution of (k) did not change according to other variables in the data generation process and that it depends only on $\eta_i(k)$. When $T \rightarrow \infty$ and $N \rightarrow \infty$, it has been shown that under the null hypothesis, Lindberg-Levy central limit theorem approaches the standard normal distribution with the mean of (k) , (k) and variance $\zeta^2(k)$.

$$FZ(k) = \frac{\sqrt{N}FP(k)}{\zeta(k)} \sim 0.1 \quad (16)$$

(k) and $\xi^2(k)$ are the values obtained from Monte Carlo simulations.

Results

H_0 hypothesis is rejected in the case that the probability value obtained from the cross-sectional dependence test is less than .05 and so it is decided that there is cross-sectional dependence between units that constitute the panel (Pesaran et al., 2008). The presence of cross-sectional dependence between variables is shown in Table 1.

As seen in Table 1, H_0 hypotheses were rejected as their probability values are less than .05. It is established that the series exhibit cross-sectional dependence. In this case, there is cross-sectional dependence between countries that make up the panel.

Results presented in Table 2 suggest the public debt variable to be stationary at level values based on probability values. Public debt can be assumed to be sustainable in given countries for the entirety of the panel.

Table 3 shows the results of Im et al. (2012) panel unit root tests with structural breaks. The trend shift model of this test considers the cross-section. The results acquired from single and two break models were compared with the table values in level and in the trend shift model, and it was concluded that the public debt variable is stationary in the entirety of the panel on the basis of individual countries. Table value obtained through the single break model is -3.950 at 5% based on the individual evaluation of countries. The test statistics values are greater than the table value in all countries except Spain. In this case, the H_0 hypothesis is rejected and the H_1 hypothesis is accepted. Thus, in Ireland, Italy, Greece, and Portugal, public debt was determined to be stable and sustainable. The table value of -4.661 in the two-break model is less than the test statistics of all given countries. In this case, it has been concluded that the public debt variable is stable and sustainable in all countries. Considering the studies on sustainability in the literature, the fact that the Debt/GDP variable

In Level	Public Debt	
	Stat.	Prob.
CDLM ₁ (Breusch & Pagan, 1980)	58.697	.000***
CDLM ₂ (Pesaran, 2004 CDLM)	10.889	.000***
CD (Pesaran, 2004 CDLM)	-2.745	.003***
LMadj (PUY, 2008)	6.976	.000***

Note: *** 1% significance levels.

Levels Public Debt	Constant	
	Statistics	p
ZA_spc	-.9079	.8180
ZA_la	-2.1396	.9838

Table 3.
Im, Lee, and Tieslau (2012) Panel Unit Root Tests with Structural Breaks

Trend Shift: One-Break Test			
Public Debt	Lag	LM-stat.	Break(s)
Portugal	0	-5.450	2010
Italy	0	-4.616	2010
Spain	1	-3.633	2010
Greece	0	-4.141	2010
Ireland	1	-5.013	2007
Panel-LM		-6.592	
p		.000	
Trend Shift: Two-Breaks Test			
Portugal	0	-7.279	2004-2010
Italy	0	-6.660	2007-2011
Spain	1	-7.152	2006-2010
Greece	2	-11.110	2009-2012
Ireland	2	-6.312	2007-2013
Panel-LM		-16.942	
p		.000	

Note: The maximum lag length is taken as 2 and the optimal lag length is determined based on the "t-stat significance" approach. Trend shift model values: single-break model -4.604 (1%); -3.950 (5%); -3.635 (10%). Two-breaks model -5.365 (1%); -4.661 (5%); -4.338 (10%). LM = Lagrange Multiplier.

has a unit root concludes that fiscal policies are "unsustainable"; The fact that it does not have a unit root (stationary) indicates that fiscal policies are "sustainable" (Hepsař, 2011).

In the study, when the frequency (k) is 1, 2, and 3 according to the fixed model, the analysis was performed with the Fourier Panel KPSS test, and the findings are presented in Table 4. In panel statistics, the null hypothesis is accepted at the statistical significance level of 5%. Accordingly, in the panel data set of the countries discussed, it has been revealed that the public debt is sustainable. Looking at the individual results, it is seen that 4 out of 5 countries (Portugal, Italy, Spain, and Ireland) are stationary when the frequency is 1 at the level (constant) and at

Constant			
Countries	Gradual/Smooth Shifts		
	k=1	k=2	k=3
Portugal	.165	.232	.225
Italy	.070	.201	.202
Spain	.052	.197	.198
Greece	.174	.207	.147
Ireland	.169	.103	.096
Panel statistic	2.507	.792	.293
p	.006	.214	.385

Note: The statistics are based on using the Bartlett Kernel with the Kurozumi (2002) rule. The p values are for a one-sided test based on the normal distribution. The constant model critical values for individual statistics are .1318 (10%), .1720 (5%), .2699 (1%) for $k=1$; .3150 (10%), .4152 (5%), .6671 (1%) for $k=2$; .3393 (10%), .4480 (5%), .7182 (1%) for $k=3$ (see Becker et al., 2006, p. 389).

the 5% significance level. When the frequency is 2 and 3, five out of these five countries (Portugal, Italy, Spain, Greece, and Ireland) are found to be stationary. This is in line with the studies of Hamilton and Flavin (1986) and Trehan and Walsh (1991), on which the article is based. In the univariate approach put forward by Hamilton and Flavin (1986) and Trehan and Walsh (1991), budget policies are sustainable if the variable obtained is the result of the ratio of public debt stock to GDP; If it does not meet the stationarity condition, it means that it is not sustainable.

Discussion and Conclusions

Many structural crises since the 19th century have begun to create more devastating effects in parallel with the globalization of the world economy. The EU is among the countries most affected by the 2008 crisis. Developed economies shrank between 3% and 4% in 2009. In this period, the Euro Area shrank by 4.1%. This shrinkage was the largest in the history of the EU.

Mortgage crisis of the United States did not remain regional and many other countries had their shares from the crisis. The crisis initially affected Greece and later impacted the entire Euro Zone in a difficult position in what might be thought of like a domino effect. Throughout the crisis, foreign debt was the major hardship for most countries in Europe. Although it is known that private sector borrowings were at an increase, the issue of public debt was common to all countries.

Most countries experienced the 2008 crisis on varying levels. While Greece struggled with public debt, twin deficits, and rising rates of unemployment, Ireland, known as the "Celtic Tiger," dealt with a budget deficit in the housing industry and banking sector on top of public debt. Portugal faced with public and private sector debt and twin deficits. Spain struggled with issues in housing and banking sectors in addition to increasing public and private sector debt and unemployment. Similarly, in Italy, public and private sector debt, budget deficit, and recession issues appeared. As one can see, the crisis did not make an equal impact on each country. Nonetheless, the common issue appears to be public debt. A high public debt poses the risk of insolvency. Public debt also restrains solvency from being used as a tool of policy against the conjuncture and increases the cost of borrowing of a country. Ultimately, rising public debt can result in a decreasing rate of production and growth. The financial crisis and the following debt crises led to a focus on the sustainability of debt. With this object in mind, the sustainability of public debt in EU countries with the highest public debt was investigated by using panel root tests with structural breaks by Im et al. (2005) based on annual data of 1995–2018.

Results obtained from single-break and two-break models were compared with the table values in level and trend shift models, and it was concluded that the public debt variable was stationary in the general of the panel as well as on the basis of individual countries. Based on this result, it was concluded that the public debt variable was stationary and sustainable in all investigated countries. The only exception was an unsustainable public debt in Portugal in 2010. With the global financial crisis experienced in 2008, I came to the conclusion that the public debt problem encountered in some EU countries has been improved in related countries except in Portugal. However, a few precautions can be taken into consideration to prevent the union from possible crises in the future. First, a unique monetary policy and several fiscal policies should be ended. Secondly,

the practice of protecting some sectors in some countries against competition should be included in the union because the competition potential of the industry and service sectors of all countries in the union is not equal. This situation prevents countries from increasing the production amount and providing effective growth power. In addition, EU member countries are required to harmonize their working hours, improve their tax and financial systems, and remove the barriers that companies face by law.

Consequently, all countries should be more cautious in the event of the next crisis and be prepared to prevent risks related to the financial sustainability of the monetary and fiscal policies implemented in the financial sector.

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Extended Summary

ABD'de başlayan Mortgage krizinin başlangıçta bölgesel bir kriz olacağı beklentisi oluşsa da Amerika'nın Avrupa ülkeleri ile olan ilişkilerinden dolayı Avrupa'daki çoğu ülkeyi etkisi altına almıştır. Amerika'da bulunan önemli bankaların iflasıyla başlayan kriz, üretim ve milli gelir düzeylerinin düşmesine neden olmuş, Avrupa ile yapılan dış ticaret işlemleri önemli derecede azalmıştır. Avrupa'da borsanın düşmesiyle birlikte bankacılık sektörü ve likidite sıkıntıları ülkelerde oluşan yüksek kamu borçları ve cari açıklarda eklenince Avrupa'da borç krizi patlak vermiştir. Ancak Avrupa borç krizine yalnızca küresel krizin neden olduğunu söylemek doğru değildir. Her ülkenin kendi iktisadi ve mali problemlerinin yanında küresel krizin etkisi de ortaya çıkan Avrupa ülkelerinde mali sorunlar daha da derinleşmiştir.

Avrupa ülkelerinde yaşanan kriz de merkez ve çevre grubu ülkeler arasında ekonomik farklılıkların olması dikkat çekici bir durumdur. Avrupa'nın merkezinde yer alan Almanya ve Fransa açısından değerlendirme yapılırsa bu ülkelerin AB politikalarında önemli etkilerinin bulunması ve Almanya'nın diğer ülkelerde rekabet etme gücünün çevre ülkelerden daha fazla olması merkez çevre arasındaki iktisadi farklılıkların daha da açılmasına neden olmuştur. AB politikalarına uyum gösteremeyen ülkelerin krizden kurtulması zorlaşmıştır. Özellikle Yunanistan, İspanya, İrlanda, Portekiz, İtalya gibi ülkelerde krizin etkisi derinden hissedilmiştir (Beşer ve Kılıç, 2019).

Avrupa krizi genel olarak değerlendirildiğinde krizin temelinde yapısal nedenler ve ekonomik politikaların koordinasyonundaki sorunların bulunduğu görülmektedir. Avro Alanı'nda bulunan ülkelerin kalkınma seviyeleri ile ekonomilerinin rekabet güçleri arasında ise önemli farklılıklar bulunmaktadır (Kılıç ve Bayar, 2013). Kamu borcu ülkelerin uyguladığı ekonomik politikaların farklılık göstermesine rağmen karşılaştıkları önemli ortak sorunlar arasındadır. Bu bağlamda çalışmada seçilmiş Avrupa ülkeleri için kamu borcunun sürdürülebilirliği incelenmiştir. Bu amaç doğrultusunda, kamu borcunun en yüksek olduğu AB ülkelerinde kamu borcunun sürdürülebilirliği Im et al. (2005) tarafından 1995-2018 yıllık verilerine dayalı yapısal kırılmalı panel kök testleri kullanılarak araştırılmıştır.

Tek kırılma ve iki kırılma modellerinden elde edilen sonuçlar, seviye ve trend modellerinde tablo değerleri ile karşılaştırılmış ve kamu borcu değişkeninin panel genelinde olduğu kadar ülkeler bazında da durağan olduğu sonucuna varılmıştır. Bu sonuca dayanarak, incelenen tüm ülkelerde kamu borcu değişkeninin durağan ve sürdürülebilir olduğu sonucuna varılmıştır.