

Budget Deficits Sustainability Of Selected Eu Countries And Turkey: Panel Cointegration Analysis

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Abstract

Sustainability of budget deficits is one of the most important macroeconomic problems in most countries. High public spending and insufficiency of public revenue are main reasons collapsing of Greek, Italy, Spain, Portugal and Ireland economies. For this reason, the conservation of budget balance and sustainability of budget deficits have a great importance.

In this study; in selected 20 European Union countries and Turkey, the sustainability of budget deficit was analyzed with via under cross-section dependence panel co-integration analysis. At the end of the analysis; cross-section dependence was determined in these countries. Therefore, an economic shock which will come to one of these countries, affects the others, too. For this reason, the shocks that have been come to series don't eliminate in the long term Co-integration relationship couldn't found between these series. Consequently, it has been seen budget deficits of these countries were unsustainable in the long term.

Keywords: Budget Deficits, Sustainability, Cross-Section Dependence, Panel Co-integration Analysis.

Jel Codes: C23, G18, H61, H62.

1. INTRODUCTION

A system that is economically sustainability keeps internal and external debt to in the manageable levels and ensures continuous production of goods and services. (Haris, 2000: 5). The concept of sustainability in terms of budget, governments can fulfill their obligations to current and future spending is the ability to manage financial resources. For that reason, the sustainable budget system ensures allocation to public resources fairly intergenerational, keeps the interest rates at a level to encourage investments, eliminates of uncertainty and thus makes the economy more durable to unexpected shocks (Intergenerational Report, 2002: 3-13).

The idea that is governments should intervene in the economy at the expense of the state budget deficit began with Keynes. Thus budget deficits have become a growing and permanent problem for countries. Many countries are attempting to pay the debts of the day, by means of the new debts. This situation is making much harder of financing and sustainability of the budget deficit. This situation is dragging countries in a vicious cycle of debt and can cause to economic crises.

In order to decrease the level of indebtedness of countries, some arrangements have been accepted with Maastricht Criteria in 1993. According to these arrangements, so as to participate into the economic and monetary union of European Union (EU) member states, the ratio of the annual government deficit to gross domestic product (GDP) must not exceed 3% at the end of the preceding fiscal year and the ratio of gross government debt to GDP must not exceed 60% at the end of the preceding fiscal year, too.

In this study, sustainability of budget deficit has been examined for 20 EU countries which their budget deficit exceed %3 of GDP in year 2011 and Turkey by means of under cross-section dependence panel unit root and panel co-integration tests for period of 2000-2011. After this point in the second section, theatrical background of sustainability of budget deficit will get involved. This section will be followed by the third section which includes the information about budget deficit of countries. This section will be followed by the fourth section which includes the literature summary and fifth section that involves the empirical analysis. The study will be completed with the conclusion and evaluation sections.

2. THEORETICAL BACKGROUND

The sustainability of the budget deficit is discussed with accounting approach and intertemporal budget constraint approach (Sriwardana, 1998). At the first approach, the sustainability of the budget deficit takes place if present discounted value of future primary surplus is greater or equal to current public debt stock. (Trehan and Walsh, 1988; Hakkio and Rush, 1991; Haug, 1991; Quintos, 1995). At the second approach he sustainability of budget deficits depends on the total values of assets and liabilities of state is equal each other or more assets than liabilities in present and future. (Buiter, 1985; Anand and Van Wijnbergen, 1989; Blejer and Cheasty, 1991).

Hakkio and Rush (1991), for the U.S economy, relationship between government expenditures and government revenues examined via intertemporal budget constraint approach by using period of 1950:Q1-1988:Q4 data. Budget revenue and expenditure to GDP ratio study is used, provided that the co-integration relationship between the series, tested whether the coefficient equal to one. If the parameter is equal to one, the budget deficits are sustainable, while smaller than one is considered to be unsustainable in the long term budget deficits.

Later Quintos (1995) has expanded these conditions. If the coefficient of the budget expenses equal to 1, the budget deficits sustainability is considered strong. If it is among between zero and one, sustainability is in a weak form. Adapted form is Hakkio and Rush's sustainability of budget deficits equations' as follows:

$$REV_t = \beta_0 + \beta_1 EXP_t + u_t \quad (1)$$

Here, REV represents to general government revenue percent of GDP (including interest incomes) and EXP represents to General government total expenditure percent of GDP (including interest payments).

3. BUDGET DEFICIT IN COUNTRIES

Lately, for the economic crises is lived in different countries, can said that uncontrolled budget deficits has got a significant share. There are budget deficits on the basis of the

economic problems in Ireland, Greece and Spain. The ratio budget deficits to GDP of the countries are shown at the Table 1.

Table 1: General Government Net Lending (Percent of GDP)

	2005	2006	2007	2008	2009	2010	2011	2011 Ranking
Japan	-3.4	-3.6	-2.1	-4.1	-10.3	-9.3	-10.1	5.
Ireland	1.6	2.8	0.1	-7.3	-14.1	-31.3	-9.8	7.
US	-3.1	-2.1	-2.7	-6.6	-13.1	-10.4	-9.5	8.
Greece	-5.5	-5.9	-6.6	-9.7	-15.5	-10.6	-9.1	9.
UK	-3.3	-2.6	-2.6	-4.9	-10.3	-9.8	-8.6	11.
Spain	0.9	2.1	1.9	-4.1	-11.1	-9.3	-8.4	13.
France	-2.9	-2.3	-2.7	-3.3	-7.5	-7.1	-5.3	37.
Canada	1.5	1.5	1.5	0.1	-4.8	-5.5	-4.5	50.
Belgium	-2.8	0.1	-0.3	-1.2	-5.8	-4.1	-4.1	59.
Portugal	-5.8	-4.1	-3.2	-3.7	-10.1	-9.7	-4.1	66.
Italy	-4.3	-3.3	-1.4	-2.6	-5.3	-4.4	-3.9	69.
Turkey	-0.2	0.1	-1.6	-2.3	-5.6	-2.7	-0.2	138.

Source: IMF-World Economic Outlook Database, April 2012

According to Table 1, the ratio of the annual budget deficit to GDP in 2011 is very high in the Japan, Ireland, USA, Greece and the United Kingdom. Turkey 138th among 184 countries. Especially the United States and other major economies, appear to be higher than the 3% level of the Maastricht criteria. The sustainability of budget deficits in these countries is at risk. Interested countries and international organizations must take action against to that situation. Ratio of the general government gross debt to GDP in countries, are shown in Table 2.

Table 2: General Government Gross Debt (Percent of GDP)

	2005	2006	2007	2008	2009	2010	2011	2011 Ranking
Japan	186.4	185.9	183.1	191.8	210.2	215.2	229.7	1.
Greece	100.2	106.1	105.4	110.7	127.1	142.7	160.8	2.
Italy	105.4	106.1	103.1	105.8	116.1	118.6	120.1	7.
Portugal	62.5	63.6	68.2	71.5	83.1	93.4	106.7	9.
Ireland	27.1	24.7	24.8	44.2	65.1	92.4	104.9	10.
US	67.8	66.6	67.1	76.1	89.8	98.5	102.9	11.
France	66.7	63.9	64.1	68.2	78.9	82.3	86.2	19.
Canada	71.6	70.2	66.5	71.1	83.5	85.1	84.9	20.
UK	42.1	43.1	43.9	52.4	68.3	75.1	82.4	22.
Germany	68.5	67.9	65.2	66.6	74.4	83.2	81.5	24.
Turkey	52.7	46.5	39.9	40.1	46.1	42.2	39.4	93.

Source: IMF-World Economic Outlook Database, April 2012

According to Table 2, the country which has the highest total public debt stock to GDP ratio is Japan. It is followed by Greece. In the Maastricht Criteria, when the ratio of total public debt to GDP passed the critical value 60%, it was considered to be risky in terms of countries. In this case, the debt stocks of major countries, has reached the values at risk. Turkey is far below the critical value and has got a better ratio.

4. LITERATURE

Since increasing the importance of sustainability of budget deficit in recently in the international scale, the numbers of empirical studies on this subject have increased. In

particular the enormous budget deficits of the United States, directed to this issue the attention of researchers. For USA economy Kremers (1989), Wilcox (1989), Roberds (1991) and Hakkio and Rush (1991), Mankiw (2010); for Greece economy Fountas and Wu (1996), Makrydakis et al.(1999); for India Fountas and Wu (1996), Makrydakis et al. (1999); for Spain Rubio et al. (2006) have found that the budget deficits are not sustainable. Vice versa for USA economy Hamilton and Flavin (1986), Trehan and Walsh (1988), Trehan and Walsh (1991), Quintos (1995), Arestis et al. (2004); for Korea Koo (2002); for Greece, Ireland, Italy and Netherlands Arghyrou and Luintel (2003); for Turkey Payne (2008) has found the budget deficits would be sustainable.

In addition, Payne (1996), has found budget deficits are unsustainable in France and Italy, but low level sustainable in Canada and United Kingdom. Panagiotis et al. (2009), tested theory of the twin deficits for Greece's economy and found that both deficits are sustainable in weak form.

About the sustainability of budget deficits in Turkey; Ozmen and Kogar (1998), Azgun and Tasdemir (2006), have reached the conclusion of budget deficit is sustainable in Turkey. Akcay et al. (2001), Ozdemir (2004) and Sen et al. (2010) have obtained the result of the budget deficit unsustainable. Gocer and Peker (2011), have determined that the budget deficit is sustainable in weak form.

5. ANALYSIS

5.1.Data Set

In this study, 20 European Union member countries, which their ratio of budget deficit to GDP has been bigger than 3% since 2011, and Turkey's REV (General government revenue Percent of GDP) and EXP (General government total expenditure Percent of GDP) data of the 2000-2011 period has been used.. Data was taken from the IMF World Economic Outlook Database April 2012.

5.2. Method

In this study; cross-sectional dependence among countries that make up panel was analyzed via Pesaran (2004) CDLM test. Cross-section dependence for variables was tested with Gauss codes; cross-sectional dependence for equation was tested using Eviews codes¹⁴.

The stationary of the series were tested with Pesaran (2006) CADF and CIPS second generation unit root tests and Gauss codes.

The presence of co-integration relationship between REV and EXP series was analyzed with Westerlund (2008) Durbin-H method and using Gauss codes.

Long term co-integration coefficients were estimated with Pesaran (2006) CCE and CCMGE methods and using Gauss codes.

5.3. Testing of Cross Section Dependence

Whether consideration or not cross-sectional dependence between series, affects the whole outcome significantly (Breusch and Pagan, 1980; Pesaran, 2004). For this reason, before

¹⁴ We grateful for these codes and their helps to Assoc. Prof. Dr. Bülent GÜLOĞLU and Asst. Prof. Dr. Şaban NAZLIOĞLU.

starting the analysis, the cross-section dependency must be tested. Because while selecting unit root and co-integration test methods, this situation must be considered. Otherwise the analysis that is done may cause wrong conclusions.

The presence of a cross-sectional dependence: when dimension of time is larger than the dimension of cross-section ($T > N$); using Berusch and Pagan (1980) CDLM1 tests, when time dimension equals to the dimension of the cross-section ($T = N$); testing via Pesaran (2004) CDLM2, if time dimension is smaller than the dimension of the cross-section ($T < N$) test makes via Pesaran (2004) CDLM tests'. Since there are 21 countries ($N = 21$), and 12 years ($T = 12$) in this study, Pesaran (2004) CDLM test has been used. Equation of CDLM tests as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \right) \square N(0,1) \quad (2)$$

Test statistic which will be obtained here, show that asymptotic standard normal distribution (Pesaran, 2004). Hypotheses of test:

H0: There isn't cross-section dependency.

H1: There is cross-section dependency

When test results obtained probability value less than 0.05, the H0 hypothesis is rejected at a significance level of 5% and be decided that there is cross-section dependency among these countries (Pesaran, 2004).

In this study, presence of cross-section dependence on the variables was tested by using gauss codes. The presence of cross-section dependence on the co-integration equation was controlled by using Eviews codes. The results are displayed in the Table 3.

Table 3: Results of CDLM Test

	Test Statistics	Prob.
REV	-1.771	0.038
EXP	0.254	0.040
Co-integration Equation	10.605	0.000

According to the results in Table 3; for the probability values are less than 0.05, the cross-section dependence on the series and co-integration equation has been seen. In this case there is cross-section dependence among the countries which have formed the panel. A shock which has come from one of the countries, affects the others. While testing the unit root and co-integration, test methods must be taking into account the cross-section dependence. On account of this, panel unit root test and co-integration analysis was made via methods which, which are considered the cross-sectional dependence.

5.4. Panel Unit Root Test

The first problem, which encountered in the panel unit root tests, is whether or not the cross-sectional units are independent each other. Panel unit root tests at this point are divided into first and second generation tests.

The first generation unit root tests assumes that the units of forming panel are independent each other. First-generation unit root tests are divided into homogeneous and heterogeneous models. While Levin, Lin and Chu (2002), Breitung (2000) and Hadri (2000) take consider

the homogen model; Im, Pesaran and Shin (2003), Maddala and Wu (1999), Choi (2001) take consider the heterogen model.

However, when a shock comes from on a unit, other units are affected by different levels is more realistic approach. To resolve this dilemma, the second generation unit root tests have been developed which considers to the cross-section dependency. Prominent second generation unit root tests are MADF (Taylor and Sarno, 1998), SURADF (Breuer, Mcknown and Wallace, 2002), CADF (Pesaran, 2006), and Bai and Ng (2004)

In this study, since cross-sectional dependence among countries has been determined, stationarity of the series has been tested with Pesaran, (2006) CADF (Augmented Dickey Fuller Cross-sectionally). ADF extended terms of cross-section in this test. It assumed the error term consist of two parts; a common parts and a specific parts to each series. Equation form of this expression is as follows:

$$Y_{it} = \beta_i Y_{i,t-1} + u_{it} \quad (3)$$

$$u_{it} = \lambda_i f_t + \varepsilon_{it} \quad (4)$$

In this equation, f_t ; unobservable represent a common element is always assumed to be stationary. Specific item in the series is ε_{it} independent and identical distributed. In this model cross-section dependence, originates from the existence of unobservable common item is assumed. The test hypotheses are as follows:

H0: $\beta_i = 0$ There is unit root.

H1: $\beta_i < 0$ There is not unit root.

At first CADF statistics calculated for each country. These calculated values are compared with Pesaran (2006) table values. If calculated CADF value is smaller than the table the critical value, H0 is rejected. So there isn't unit root in this country data and shocks are temporary.

Later to decide whether or not unit root is existed in general of panel; by calculating arithmetic mean of CADF values of all countries, statistic of CIPS is obtained. The test hypotheses are CIPS same as CADF. Equation of CIPS is as follows:

$$CIPS = \frac{\sum_{i=1}^N CADF_i}{N} \quad (5)$$

Calculated CIPS value is compared with Pesaran (2006) table values. If calculated CIPS value is smaller than the table the critical value, H0 is rejected. So there isn't unit root in this panel data and shocks are temporary for all units. CADF and CIPS statistics calculated and results were given in Table 4.

Table 4: Results of CADF and CIPS Tests

Country	EXP		REV	
	p	CADF Statistic	p	CADF Statistic
Austria	4	-5.00	1	-3.69
Bulgaria	5	-3.91	2	-2.45
Cyprus	4	-5.28	1	-4.11
Czech Republic	1	-3.08	2	-2.97
Denmark	1	-2.32	3	-2.29
France	4	-3.12	4	-2.15

Greece	1	-2.08	5	-2.47
Ireland	5	-4.79	4	-2.26
Italy	4	-4.03	5	-1.99
Latvia	5	-5.26	2	-3.93
Lithuania	1	-4.20	1	-3.37
Malta	2	-4.04	1	-3.53
Netherlands	3	-3.70	1	-3.74
Poland	3	-3.90	2	-3.54
Portugal	4	-4.81	2	-2.78
Romania	1	-4.41	1	-3.20
Slovak Republic	5	-4.36	2	-2.83
Slovenia	4	-1.81	1	-3.31
Spain	1	-3.60	2	-2.78
Turkey	4	-2.04	3	-3.23
United Kingdom	4	-3.82	1	-2.45
CIPS Statistic		-3.80		-3.02

Note: Critic values get from; Pesaran (2006) pp. 46
Table 1c for 1% significance level is = - 4.96^{dir}.

Since the computed CIPS statistics are not smaller than the table critic value, so H₀ is accepted and it is concluded that panel unit root is existed in the series of panel. In this case, series are nonstationary at level¹⁵. This case is showing that the effects of shocks from the economies of the countries don't lost immediately. For series are nonstationary, to analyze the relationship between the series of co-integration is decided.

5.5. Panel Co-integration Analysis

Long-run relationship between variables, analysis via panel co-integration method is widely used in empirical analysis (Pedroni, 1999; Pedroni, 2004; Westerlund 2007; Westerlund ve Edgerton, 2007; Westerlund, 2008).

At this stage of the study, firstly between series existence of co-integration was determined, after; individual and panel co-integration coefficients were estimated.

5.5.1. Testing the Existence of Co-integration Relationship

At this stage of the study, the sustainability of budget deficits was analyzed by means of the co-integration between the revenue and expenditure series. Cross-section dependency was observed, co-integration of the panel presence, was tested by the Westerlund (2008) Durbin-H method. The test hypotheses are as follows:

H₀: There is co-integration relationship.

H₁: There isn't co-integration relationship.

¹⁵ It is seen EXP series of Austria, Cyprus and Latvia stationary in level value, namely I(0). In this situation looking to CIPS statistic (Pesaran, 2006). According to CIPS statistic, in the entire of panel is I(1). Addition for panel co-integration analysis applied via Westerlund (2008) Durbin-H method, because this method permis so long as dependent variable I(1), independent variables can be I(1) or I(0). So the risk was eliminated.

Estimated Durbin-H statistics values are compared with normal distribution table values. If estimated value is bigger than the table the critical value, H₀ is rejected. So it is decided that the presence of the co-integration relationship between series.

In Westerlund (2008) Durbin-H method, the presence of co-integration relationship between the dimension of group and panel is separately tested. In Westerlund (2008) Durbin-H group co-integration test; the autoregressive parameter is allowed to differ between cross-sections. In this test, when H₀ hypothesis is rejected, there is co-integration relationship for at least some sections. In Westerlund (2008) Durbin-H panel co-integration test; the autoregressive parameter is considered to be the same for all cross-sections. Under this assumption, when H₀ hypothesis is rejected, there is co-integration relationship for all sections. (Di Iorio and Fachin, 2008; Bayar, Güloğlu and Selman, 2011). Westerlund (2008) Durbin-H-test was applied and results can be seen in Table 5.

Table 5: Results of Westerlund (2008) Durbin-H Test

Durbin-H Group Statistic	109.907
Durbin-H Panel Statistic	0.227

Note: Normal distribution critic values for 5% significance level is = 1.645.

It was seen that estimated group statistic, larger than 1.645 critical values. In this case, H₀ hypothesis was rejected for the group. It was decided to there are co-integration relationships between budget revenues and expenditures in some countries in the panel and budget deficits are sustainable in these countries.

It has been seen that obtained panel statistic smaller than the critical value. So H₀ hypothesis was accepted, and in this case, the panel co-integration relationship between budget revenues and expenditures are not to be existed. In conclusion, it was decided to budget deficits were unsustainable in the entire the panel.

5.5.2. Finding Coefficients of Co-integration

In order to estimate the long term coefficients CCE (Common Correlated Effects) method, which is developed by Pesaran (2006) to consider the cross-sectional dependence, is used. CCE test results are shown in Table 6.

Table 6: Results of CCE Test

Country	Long-term Co-integration Coefficients	t Statistics
Austria	0.263	1.12
Bulgaria	0.531	2.39
Cyprus	0.597	2.94
Czech Republic	0.599	13.02
Denmark	0.298	0.76
France	0.14	1.05
Greece	0.075	0.43
Ireland	0.081	1.88
Italy	0.1	0.54
Latvia	0.312	1.62
Lithuania	0.397	3.89
Malta	0.124	0.35
Netherlands	0.236	1.70
Poland	0.447	4.22

Portugal	0.641	4.06
Romania	0.398	3.59
Slovak Republic	0.383	8.33
Slovenia	0.302	5.92
Spain	0.229	1.33
Turkey	0.353	20.76
United Kingdom	0.091	1.78
CCMGE	0.11	1.86

In Table 6, the long-term co-integration coefficients are smaller than 1. According to Hakkio and Rush (1991) and Quintos (1995), budget deficits in these countries are unsustainable.

Under the assumption that long-term co-integration parameters of countries are homogeneous, CCMGE (Common Correlated Mean Group Effects) were estimated. This method developed Pesaran (2006). CCMGE is estimated by averaging the values of the group. This estimation was made and obtained 0.11. This coefficient is smaller than 1. Therefore, in this countries budget deficits are unsustainable in the long run.

6.RESULTS AND DISCUSSION

In this study, sustainability of budget deficit has been examined for 20 EU countries which their budget deficit exceed %3 of GDP in year 2011 and Turkey by means of under cross-section dependence panel unit root and panel co-integration tests for period of 2000-2011.

The cross-section dependency for variables and co-integration equation were tested via Pesaran (2004) CDLM method. As a result of this analysis cross-section dependency was determined. In this case, a shock comes from one of these countries that affect the others, too. To that end, policy-determining nations, in interaction can be said that they needed to consider the developments relating to the country. For cross-sectional dependence is determined on the panel, while selecting the panel unit root and co-integration tests, this must be take into account. Therefore, taking into account the dependence of cross-sectional study, panel unit root test and co-integration analysis that takes into account the dependence of cross-sectional methods are used.

Panel unit root was tested by means of Pesaran (2006) CADF and CIPS and the series were found nonstationary. This situation shows that the effects of shocks have not lost to the economies of the countries.

The presence of the panel co-integration relationship is tested by Westerlund (2008) Durbin-H method. When co-integration relationship determined for some countries, in the entire of panel co-integration relationship couldn't determined. From this remark the budget deficits are unsustainable for these countries.

Long-term individual co-integration coefficients have been estimated via Pesaran (2006) CCE method, panel co-integration coefficient is estimated through CCGME method. It is found that in these countries the budget deficit is unsustainable according to Rush Hakkio (1991) and Quintos (1995). As the co-integration coefficient is smaller than 1. The empirical findings have shown that budget deficits are unsustainable in the long term in those countries.

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