Theoretical and Applied Economics
Volume XXII (2015), No. 1(602), pp. 133-144

The measurement of fiscal behavior in some European countries: Panel data perspective

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Abstract. *This paper tests for budget balance of 12 European countries over the period 1999:1-2013:2 by the Sequential Panel Selection Method (SPSM) developed by Chortareas and Kapetanios (2009) using the Panel KSS test with a Fourier function. This article analyses both Kapetanios et al. (2003, hereafter, KSS) without Fourier and KSS with Fourier function. SPSM method tests for unit root that jointly consider structural breaks and nonlinear adjustment. It is applied to the data on 12 European countries and we classify the whole panel into a group of stationary and nonstationary series. In doing so, we can clearly determine which series in the panel are stationary process. We reported the results of the Panel KSS test with a Fourier function and found that the budget balance in 7 countries are stationary and this result is in accord with intertemporal budget constraint. Other hand, budget balance in five countries, namely Finland, United Kingdom, Sweden, Portugal and Latvia has in violation of their intertemporal budget constraint.*

Keywords: Fiscal policy, budget balance, Panel KSS unit root tests, Fourier function.

JEL Classification: C23, E62, H62.

1. Introduction

Measuring fiscal balance has been debated in economic literature over the past decades. The task of this study is to extend the literature on the empirical testing whether fiscal balance of some EU countries is compatible with government's intertemporal budget constraint (IBC). The intertemporal budget constraint (IBC) in present value terms is also used as the present value budget constraint (PVBC) in the US economics literature. It has been a vital topic in the field of the sustainability of public finance in the long term. In fiscal policy literature, this approach is generally used to investigate the government budget constraint or public debts and fiscal deficits of government (Bohn, 2007; Bravo and Silvestre, 2002). The first approach of this area was developed by Hamilton and Flavin (1986). According to this approach, if budget deficit is not unit root or stationary, deficit can be accepted as sustainable. On the contrary, if budget deficit is not stationary, deficit is not accepted mean-reversion. Sustainable fiscal balance suggests that the property of budget balance follows mean reversion process. To satisfy the fiscal balance is important for fiscal policy management and the balance of fiscal policy needs the persistence of it. If the budget balance has unit root, shocks will affect the budget balance for long time. In this way, shocks affecting the budget balance cause to some problems in fiscal policy.

If budget deficits are not sustainable, there seems to need for policy decisions in order to adjust in expenditures and tax revenues to satisfy the costs. Therefore, policy makers have to take into account the size of the budget and surplus-deficit policies and they need to determine expenditures and tax policy (Payne and Mohammadi, 2006). The maintaining of fiscal balance is related to the financial solvency of the government and is connected to the current and expected future fiscal and economic policies. If economic and fiscal agents expect the current and future fiscal and economic policies to cause intertemporal budget constraint fiscal process is sustainable and *vice versa*. If a given fiscal policy estimates to be unsustainable, it has to transform a position that the future primary balances are consistent with the budget constraints. This approach is firstly used by Hamilton and Flavin (1986). They examined US deficit over the period 1962 to 1984 to determine whether the deficit follows a stationary process (Hakkio and Rush, 1991; Afonso, 2005). In recent years, the increased budget deficit and public debt experienced by many developed and developing countries have led to the increasing importance of government finance in the long run. Fiscal deficits have especially been receiving growing attention from economists. This is an important issue regarding both economics and public fiscal policy (Afonso, 2005). Therefore, the main objective of satisfying fiscal balance is that a country should have a macroeconomic stability to maintain the budget deficit and public debt within sustainable limits (Ehrhart and Llorca, 2008). The aim of our study is to test the persistence of fiscal balance for 12 European Union countries over the period 1999:1-2011:4 with nonlinear unit root.

There are two classifications about the empirical studies of budget deficit. The first group of studies has investigated the possibility of stationary of budget balance by testing with unit root tests. There are lots of papers on stationary test in order to examine the intertemporal budget constraint. For details on previous studies, please refer to the works of Hamilton and Flavin (1986), Kremers (1988), Wilcox (1989), Trehan and Walsh (1991), Baglioni and Cherubini (1993), Sawada (1994), Caporale (1995), Vanhorebeek and Rompuy (1995), Siriwardana (1998), Greiner and Semmler (1999), Makrydakis, Tzavalis and Balfoussias (1999), Uctum and Wickens (2000), Getzner, Glatzer and Neck (2001). Other hand, Lau and Baharumshah (2009) investigated the fiscal policy sustainability in 10 Asian countries by adopting unit root tests. They found that only cross sections for out of 10 countries in the panel are stationary. Cuestas and Staehr (2013) analysed the properties of the budget balance in the 10 EU countries from Central and Eastern Europe. Results show that the budget balance processes in these countries exhibit substantial instability. Second group studies focus on the long run relationship between revenues and expenditures by examining cointegration methods. In the literature, there are some studies such as Trehan and Walsh (1988), Hakkio and Rush (1991), Tanner and Liu (1994), Ahmed ve Rogers (1995), Haug (1995), Quintos (1995), Payne (1997), Wu (1998), Papadopoulos- Sidiropoulos (1999), Martin (2000), Green, Holmes and Kowalski (2001), Bravo and Silvestre (2002), Hatemi-j (2002), Afonso (2005), Prohl and Westerlund (2009), Westerlund and Prohl (2010), Adedeji and Thornton (2010), Afonso and Rault (2010).

First, this paper contributes into the public finance literature in terms of testing the budget balance for some European countries. Second, it examines a whole panel into groups of stationary and nonstationary series with sequential panel selection method (SPSM) developed by Chortareas and Kapetanios (2009) using quarterly dataset of 12 European countries. Third, this article analyses both Kapetanios et al (2003, hereafter, KSS) without Fourier and KSS with Fourier function. SPSM method tests for unit root that jointly consider structural breaks and nonlinear adjustment. Fourth, this paper tests based on a nonlinear framework and Ucar and Omay (2009) nonlinear framework in KSS. Using panel methods to examine the unit root of the series may be more efficient and power results compared with other tests. The plan of this paper is organized as follows. Section II presents the data used in our study. Section III describes the SPSM proposed by Chortareas and Kapetanios (2009) and then discusses our empirical findings in Section IV and finally, Section V concludes the paper.

2. Data

This empirical analysis covers the fiscal balance rate for 12 European countries, namely Austria, Belgium, Bulgaria, Czech Republic, Estonia, Finland, Latvia, Portugal, Slovakia, Slovenia, Sweden and United Kingdom. We use quarterly data drawn from the *Eurostat Database* and all data span from 1999:1 to 2013:2. These countries have been selected according to the data available. The seasonally adjusted series for budget balances were compiled using the Census X-11 procedure and summary statistics are provided in Table 1.

Table 1. *Summary Statistics of Budget Balance to GDP for Each Country*

Country	Mean	Median	Std	Max.	Min.	Skewness	Kurtosis
Austria	-2.177	-1.902	1.903	0.800	-10.508	-1.516	7.592
Belgium	-1.638	-0.862	2.411	3.886	-9.735	-0.792	3.821
Bulgaria	-0.104	-0.439	3.385	7.925	-7.016	0.307	2.910
Czech Republic	-3.956	-3.465	2.351	2.425	-12.092	-0.793	5.100
Estonia	0.164	0.591	2.633	8.096	-7.968	-0.669	4.834
Finland	2.030	2.574	3.245	7.151	-3.817	-0.366	1.886
Latvia	-2.816	-2.499	3.171	1.687	-12.180	-1.059	3.741
Portugal	-5.193	-5.107	3.066	3.447	-11.650	0.178	3.348
Slovakia	-5.231	-4.426	3.075	-0.905	-14.145	-0.874	3.458
Slovenia	-3.336	-2.974	2.051	0.217	-7.349	-0.221	2.211
Sweden	0.825	0.357	1.687	3.876	-2.325	0.261	1.853
UK	-3.853	-3.444	4.077	6.486	-11.813	-0.036	2.884

Notes: The sample period is from 1999:1 to 2013:2 and Std denotes standard deviation.

3. Methodology

The main feature of panel unit root tests is the ability to exploit coefficient homogeneity under unit root null hypothesis for all series. However, under the alternative hypothesis of heterogeneous panel unit root tests at least one series being stationary, the results are not explicit enough. If the unit root hypothesis is rejected, it is impossible to know series that caused the rejection. Rejecting the null hypothesis, the researcher is in a difficult situation with distinguishing the stationary from non-stationary series in a panel. Although one knows that the null hypothesis of aggregate panel can be rejected, he cannot identify the series that caused the rejection. In order to avoid this problem, Chortareas and Kapetanios (2009) applied a new procedure for PPP literature that allow them to distinguish the set of series into a group of stationary and a group of non-stationary series (Chortareas and Kapetanios, 2009; Chang, 2011; Pan et al., 2012; Chang and Chang, 2012; Zhang et al., 2013).

This paper used the sequential panel selection method (SPSM) advanced by Chortareas and Kapetanios (2009). The panel method is used a sequence of panel unit root tests to distinguish between stationary and non-stationary series. If more than one series are non-stationary, then the use of panel methods to examine the unit root properties of the set of series may be more efficient and powerful compared with univariate methods. This method starts by testing the null of all series being unit root processes along the lines considered in many heterogeneous panel unit root tests. If the null is not reject, it is accepted the non-stationarity hypothesis and the procedure stops. If the null is rejected, it is removed from the set of series the one with the minimum individual Dickey-Fuller test (or KSS statistics) and repeats the panel unit root test on the remaining set of series. This procedure of the test is continued until either the test does not reject the null hypothesis or all the series are removed from the set. The end result is a separation of the set of variables into a set of stationary variables and a set of non-stationary variables (Chortareas and Kapetanios, 2009).

The panel KSS unit root test is based on detecting the presence of non-stationarity against a nonlinear but globally stationary Exponential Smooth Transition Autoregressive (ESTAR) process (Ucar and Omay, 2009). The model is given by

$$\Delta X_{i,t} = \lambda_i X_{i,t-1}[1-\exp(-\theta_i X_{i,t-1}^2)] + \zeta_{i,t} \quad (1)$$

where $X_{i,t}$ is the data series of interest, $\zeta_{i,t}$ is an i.i.d. error with zero mean and constant variance, and $\theta \geq 0$ is the transition parameter of the ESTAR model. Under the null hypothesis, $X_{i,t}$ follows a linear unit root process, but $X_{i,t}$ follows a nonlinear stationary ESTAR process under the alternative. One shortcoming of this framework is that the parameter λ is not identified under the null hypothesis. Kapetanios et al. (2003) use a first-order Taylor series approximation for $[1-\exp(-\theta_i X_{i,t-1}^2)]$ under the null hypothesis $\theta = 0$ and then approximate Eq. (1) by using the following auxiliary regression:

$$\Delta X_{i,t} = \eta_i + \partial_i X_{i,t-1}^3 + \sum_{j=1}^{k} \beta_i \Delta X_{i,t-j} + \xi_{i,t}, \; t = 1,2,...,T \quad (2)$$

where $\partial_i = \theta_i \lambda_i$, and η and β are the estimated parameters. Under this framework, the null and alternative hypotheses are expressed as $\partial = 0$ (nonstationarity) against $\partial < 0$ (nonlinear ESTAR stationarity).

Main steps of SPSM method proposed by Chortareas and Kapetanios (2009) are as follows:

1) The KSS test without and with Fourier function is performed on the all fiscal balances in the panel. If the unit root null is not rejected, the procedure is stopped. Thus, all the series in the panel are nonstationary. On the other hand, if the null hypothesis is rejected, go to the step 2.
2) Remove the series with the minimum KSS statistic, because it is defined as being stationary.
3) Step 1 is repeated for the remaining series or the procedure is stopped if all the series are removed from the panel. The final result is a separation of the all panel into the sets of mean-reverting and non-stationary variables.

4. Empirical results

The purpose of this paper is to examine the unit root properties of budget balance for the 12 countries in Europe. We continue with the SPSM procedure mixed with the Panel KSS test in order to determine which series in the panel are stationary processes. The Panel KSS procedure includes test results without a Fourier function. Recently, there is a growing consensus that fiscal structure exhibits nonlinearities. Testing the unit root properties, conventional unit root tests have low power in detecting the mean reversion of fiscal balance. Therefore, stationarity test based on a nonlinear framework developed by Ucar and Omay (2009) suggests a nonlinear panel unit root test by combining the nonlinear framework in Kapetanios et al. (2003) with the test procedure of Im et al. (2003). Generally, panel unit root tests include tests of a unit root for all members of a panel. Therefore they become inadequate for determining the mix of I(0) or I(1) series in panel setting. They are not useful in testing the fiscal balance and have low power in determining the mean reversion of budget balance. Therefore, we proceed to use the SPSM combined with the panel KSS unit root test with a Fourier function to examine time series properties in the panel display budget balance of some European countries. Especially, SPSM procedure classifies the whole panel into as a group of stationary and nonstationary series.

Tables 2 and 3 present the results for the first- and second generation panel-based unit tests. Table 2 shows the results from three first-generation panel-based unit root tests namely the Levin–Lin–Chu (Levin et al., 2002), Im–Pesaran–Shin (Im et al., 2003), and MW (Maddala and Wu, 1999).

Table 2. *First Generation Panel Unit Root Test*

Levin et al. (2002)	t_p^*	$\hat{p}$	t_p^{*B}	t_p^{*C}	
	4.296	-0.184	3.933	3.724	
	(1.000)	(0.000)	(1.000)	(1.000)	
Im et al. (2003)	t_bar_{NT}	$W_{t,bar}$	$Z_{t,bar}$	$t\_bar_{NT}^{DF}$	$Z_{t,bar}^{DF}$
	-2.863	-5.31	-5.313	-3.251	-6.85
		(0.000)	(0.000)		(0.000)
Maddala and Wu (1999)	P_{MW}	Z_{MW}			
	63.134	5.648			
	(0.000)	(0.000)			

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The numbers in parentheses denote the p-value. In Levin et al. (2002) test, t_p^* refers the adjusted t-statistic computed with a Bartlett kernel function and a common lag truncation parameter given by $\hat{K} = 3.21T^{1/3}$. In this table, tp * denotes the adjusted t-statistic computed with a Bartlett kernel function and a common lag truncation parameter. Corresponding p-value is in parentheses. The numbers in parentheses denote the p-value. $\hat{p}$ is the pooled least estimator. Corresponding standard error is in parentheses. t_p^{*B} means the adjusted t-statistic computed with a Bartlett kernel function and individual bandwidth parameters. In the end, t_p^{*C} indicates the adjusted t-statistic computed with a Quadratic Spectral kernel function and individual bandwidth parameters.

For Im et al. (2003) test, $t\_bar_{NT}^{DF}$ and t_bar_{NT} indicate the Dickey Fuller and Augmented Dickey Fuller individual statistics. $Z_{t,bar}^{DF}$ is the standardized $t\_bar_{NT}^{DF}$ statistic and associated p-values are in parentheses. $Z_{t,bar}$ is the standardized t_bar_{NT} statistic based on the moments of the Dickey Fuller distribution. $W_{t,bar}$ indicates the standardized t_bar_{NT} statistic based on simulated approximated moments. The corresponding p-values are in parentheses. Finally, Maddala and Wu (1999) test show that P_{MW} indicates the Fisher's test statistic defined as $P_{MW} = -2\sum \log(p_i)$; where p_i are the p-values from ADF unit root tests for each cross-section. Under H_0: P_{MW} has x^2 distribution with 2N of freedom when T tends to infinity and N is fixed. Z_{MW} is the standardized statistic used for large N samples: under H0; ZMW has a N(0, 1) distribution when T and N tend to infinity.

Interesting to note that Levin et al. (2002) test does not rejects the null hypothesis of unit root whereas Im et al. (2003) and Maddala and Wu (1999) do. It is worthy to mention that all the three panel unit root tests of first generation do not take in to account the bias that may arise due to cross-sectional dependence. It is verified in the panel unit root literature that failure to consider contemporaneous correlations among data creates bias in the panel-based unit root test toward rejecting the joint unit root hypothesis (see for example, O'Connell 1998). This problem is solved in the second-generation panel unit root tests which thus makes these tests a superior way to examine the long-term behaviour of the series in consideration. In our study we used three second-generation panel-based unit root tests in the study namely Bai and Ng (2004), Choi (2002), and Pesaran (2007). Table 3 presents the results drawn from the second-generation panel-based unit root tests. The result indicates that the inference drawn from the first generation panel unit root test is valid. That is with use of second generation panel unit root test we find that the null hypothesis of unit root is rejected.

Table 3. *Second Generation Panel Unit Root Test*

Bai and Ng (2004)	$\hat{r}$	$Z_{\hat{e}}^{c}$	$P_{\hat{e}}^{c}$	MQ_c	MQ_f
	2	7.012***	72.579***	0	1
		(0.000)	(0.000)		
Choi (2002)	P_m	Z	L^*		
	13.358***	-7.773***	-9.163***		
	(0.000)	(0.000)	(0.000)		
Pesaran (2007)	P*	CIPS	CIPS*		
	2	-2.813***	-2.813***		
		(0.010)	(0.010)		

Notes: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The numbers in parentheses denote the p-value. Bai and Ng (2004): $\hat{r}$ is the estimated number of common factors, based on IC criteria functions. $P_{\hat{e}}^{c}$ is a Fisher's type statistic based on p-values of the individual ADF tests. $Z_{\hat{e}}^{c}$ is a standardized Choi's type statistic for large N samples. The first estimated value of $\hat{r}_1$ is derived from the filtered MQ_f test and the second one is derived from the corrected test MQ_c. Choi (2002) show that the P_m test is a modified Fisher's inverse chi-square test. The Z test is an inverse normal test and the L^* test is a modified logit test. Pesaran's CIPS test is the mean of individual Cross sectionally augmented ADF statistics (CADF) and CIPS* indicates the mean of truncated individual CADF statistics. Additionally, P^* states the nearest integer of the mean of the individual lag lengths in ADF tests.

As stated before, panel-based unit root tests are joint tests of a unit root for all panel members and cannot determine the combination of I(0) and I(1) series in a panel setting. Further, failure to incorporate structural breaks in the model cannot efficiently detect mean reversion in budget balance. Therefore, we proceed to use the SPSM combined with the panel KSS unit root test with a Fourier function to identify how many and which country in the panel show budget balance.

In our paper, firstly we examine the results of the panel KSS unit root test without a Fourier function. In our study, Table 4 shows the results of Panel KSS unit root test without a Fourier function on the budget balance. This table displays a sequence of the

Panel KSS statistics with their bootstrap *p*-values on a reducing panel and individual minimum KSS statistics. As see from Table 4, the null hypothesis of unit root in the budget balance was rejected when the Panel KSS unit root test was first applied to the whole panel, producing a value of -3.166 with a very small p-value of 0.000. Therefore, we found Belgium is stationary with the minimum KSS value of -5.956 among the panel. After that, Belgium is removed from the panel and the Panel KSS unit root test again was performed to the rest of panel series. After performed, we found that Estonia is also stationary with a value of -2.912 (with *p*-value of 0.000) and the minimum KSS value of -4.817 among the panel. Again, Estonia is then removed the panel and the Panel KSS unit root test was performed to the rest series. SPSM procedure was continued until the UO test failed to reject the unit root null at the 10% significance level. Hence, we found that this procedure stopped at sequence 6, when the budget balances for six countries (i.e., Belgium, Estonia, Czech Republic, Bulgaria, Slovakia and Austria) were removed from the panel. The rest of the series are not stationary and failed to reject the unit root null hypothesis. The SPSM procedure using the Panel KSS unit root without a Fourier function is weak evidence for the long-run.

Table 4. *Panel KSS Unit Root Test without Fourier Function*

Sequence	UO Statistic	Minimum KSS statistic	Series
1	-3.166 (0.000)***	-5.956	Belgium
2	-2.912 (0.000)***	-4.817	Estonia
3	-2.721 (0.000)***	-4.403	Czech Republic
4	-2.534 (0.000)***	-4.356	Bulgaria
5	-2.307 (0.002)***	-3.990	Slovakia
6	-2.066 (0.016)**	-3.710	Austria
7	-1.792 (0.115)	-2.647	Sweden
8	-1.621 (0.233)	-2.248	Finland
9	-1.465 (0.378)	-2.018	Slovenia
10	-1.281 (0.671)	-1.706	UK
11	-1.068 (0.714)	-1.216	Portugal
12	-0.920 (0.782)	-0.920	Latvia

Notes: UO statistic is the constant average KSS statistic. The maximum lag is set to be 8. The numbers in parentheses stand for *p*-values and are computed by means of the bootstrap replications which are 10.000. The critical values for individual *t*-statistics are organized in KSS's (2003) Table 1. *** and ** indicate significance at 1% and 5% levels, respectively.

In Table 5, we can clearly determine the number of stationary processes and identify them in the panel. Therefore, we proceed with the panel KSS unit root test with a Fourier function. Firstly, a grid-search is implemented to find the best frequency because no a priori knowledge with reference to the shape of the breaks in the data. We calculate for each integer k = 1,..., 5 with recommendations of Enders and Lee (2012) that a single frequency can capture a wide variety of breaks. As presented in the fourth column of Table 5, the residual sum of squares (RSS s) implies that the residual sum of squares indicates a single frequency (k = 1) perform for only one of the series, and the frequencies between k = 2 to 5 are found for the other eleven series. Table 3 reports the results of Panel KSS unit root test with a Fourier function on the budget balance for European countries. We also give a sequence of the Panel KSS statistics with their bootstrap p-values on a reducing panel, the individual minimum KSS statistic, and the stationary series determined by this procedure each time.

As we can see from Table 5, the null hypothesis of unit root in the budget balance was rejected when the Panel KSS unit root test was first applied to the whole panel, producing a value of -3.535 with a very small p-value of 0.000. After performed the SPSM procedure, we found Belgium is stationary with the minimum KSS value of -6.620 among the panel. After Belgium is removed from the panel, the Panel KSS unit root test was applied again to the remaining set of series. As a result of this, we identified that the Panel KSS unit root test still rejected the unit root null hypothesis with a value of -3.255 (p-value of 0.000), and Estonia was derived to be stationary with the minimum KSS value of -5.239 among the panel this time. Then, Estonia is removed from the panel and the Panel KSS unit root test was implemented again to the rest set of series. After that, we found that the Panel KSS unit root test still rejected the unit root null hypothesis with a value of -3.056 (p-value of 0.000). Slovakia was found to be stationary with the minimum KSS value of -4.838 among the panel this time. After Slovakia is removed from the panel, again the Panel KSS unit root test was applied for the remaining set of series. SPSM procedure was continued until the Panel KSS unit root test failed to reject the unit root null hypothesis at the 10% significance level. This procedure is stopped at sequence 7, when the budget balance for 7 countries, namely Belgium, Estonia, Slovakia, Czech Republic, Bulgaria, Slovenia and Austria were removed from the panel. When we check out our test for robustness, we continued the procedure until the last sequence. We found that the Panel KSS statistic failed to reject the unit root null hypothesis for the remaining series.

Table 5. *Panel KSS Unit Root Test with Fourier Function*

Sequence	UO Statistic	Minimum KSS statistic	Fourier (*k*)	ies
1	-3.535 (0.000)***	-6.620	3	Belgium
2	-3.255 (0.000)***	-5.239	4	Estonia
3	-3.056 (0.000)***	-4.838	2	Slovakia
4	-2.858 (0.000)***	-4.763	2	Czech Republic
5	-2.620 (0.001)***	-4.714	4	Bulgaria
6	-2.321 (0.009)***	-4.026	5	Slovenia
7	-2.037 (0.036)**	-3.817	2	Austria
8	-1.681 (0.139)	-2.650	4	Finland
9	-1.439 (0.233)	-1.697	2	UK
10	-1.352 (0.373)	-1.678	1	Sweden
11	-1.190 (0.457)	-1.262	4	Portugal
12	-1.117 (0.439)	-1.117	2	Latvia

Notes: UO statistic is the constant average KSS statistic. The maximum lag is set to be 8. The numbers in parentheses stand for *p*-values and are computed by means of bootstrap simulations using 10,000 replications. Fourier (*k*) is chosen by minimum sum square of residual for Fourier function. UO statistic is developed by Ucar and Omay (2009). *** and ** indicate significance at 1% and 5% levels, respectively.

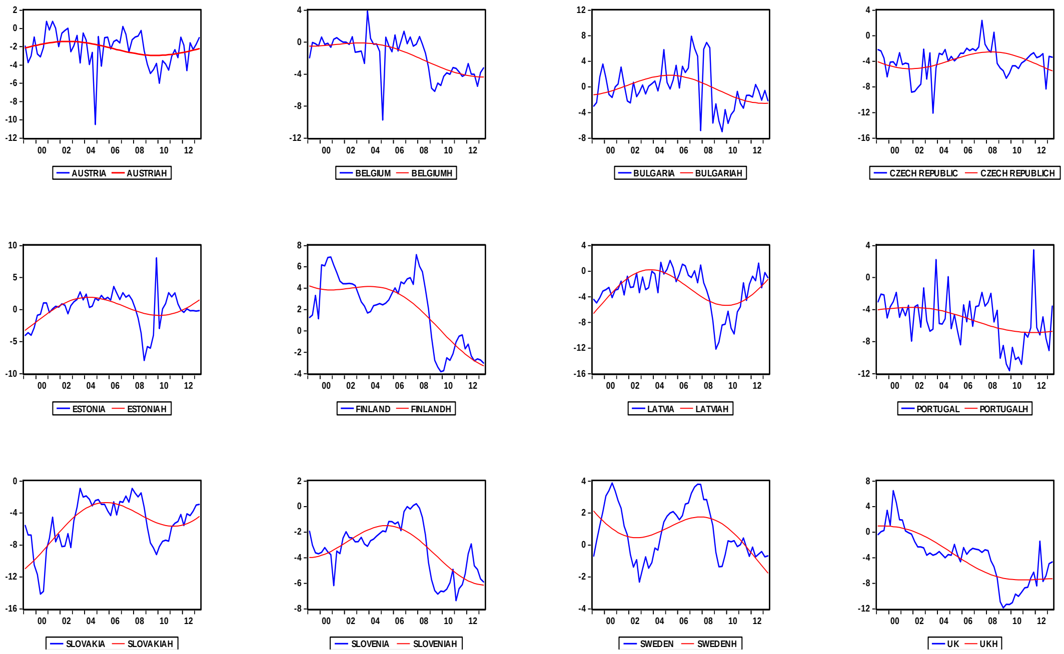
As a result of testing, the SPSM procedure with a Fourier function provided strong evidence in favour of long-run for twelve European countries. Conclusions show that budget balance holds of European countries except for Finland, United Kingdom, Sweden, Portugal and Latvia under Fourier test. The results point to the importance of proper modeling of structural breaks and nonlinearities in budget balance of European countries. Our results support for budget balance of seven countries and these countries are nonlinear stationary. That is, a deviation of their budget balance is mean reverting.

5. Conclusions

We tested the mean-reverting properties of the budget balance for 12 European countries over the period 1999:1-2013:2 using SPSM approach proposed by Chortareas and Kapetanios (2009). These tests determined which series in the panel are stationary. In this paper, it is tested the validity of long run the budget balance for 12 European countries, namely Austria, Belgium, Bulgaria, Czech Republic, Estonia, Finland, Latvia, Portugal, Slovakia, Slovenia, Sweden and United Kingdom.

Our empirical study proves that the budget balance holds for six countries, namely Belgium, Estonia, Czech Republic, Bulgaria, Slovakia and Austria using the Panel KSS unit root without a Fourier function. But this method is weak evidence for the long-run in order to use the Panel KSS unit root without a Fourier function. Other our findings show that budget balance holds of selected all European countries except for Finland, United Kingdom, Sweden, Portugal and Latvia under Fourier test. We found that all countries are on sustainable path in terms of fiscal policies except Finland, United Kingdom, Sweden, Portugal and Latvia. Otherwise, we found evidence to be violated the intertemporal budget constraint with their budget deficits. Although increasing fiscal imbalances in European area, it is surprised that some countries have a sustainable fiscal balance. Basically, policymakers look forward to transitory effects for the budget balance.

Figure 1. *Time Series Plots of Budget Balance to GDP and Fitted Nonlinearities (1999:1-2013:2)*



Source: Author's calculation.

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