10. THE TWIN DEFICITS IN SELECTED CENTRAL AND EASTERN EUROPEAN ECONOMIES: BOUNDS TESTING APPROACH WITH CAUSALITY ANALYSIS

M. Umur TOSUN[1]
Pelin Varol İYIDOĞAN[2]
Erdinç TELATAR[3]

Abstract

The aim of our paper is to explore empirically the existence of the long-run relationship and the direction of causality between the budget and current account deficits for some selected Central and Eastern European economies. Bulgaria, Latvia, Lithuania, Poland, Romania, Serbia and Slovenia are the sample countries. The empirical analysis hinges on the Pesaran, Shin, and Smith (2001) bounds testing approach to co-integration and Granger non-causality. No evidence in favor of twin deficits hypothesis has been obtained for the selected countries, except for Bulgaria, as the results support non-causality.

Keywords: budget deficit; current account deficit; twin deficits hypothesis; bounds testing; Granger non-causality

JEL Classification: C32; F30; H62

Introduction

In recent years, a number of studies analyzed the issue of twin deficits, the hypothesis that it was a positive causality from the budget deficit to the current account of the balance of payments. The relationship between the deficits was firstly observed by a number of researchers, such as McKinnon (1980), Volcker (1984) and Gordon (1986) in the case of the United States. These studies have been supplemented by others for

[1] *Department of Public Finance, Hacettepe University, Ankara, Turkey ; email:utosun@hacettepe.edu.tr.*
[2] *Department of Public Finance, Hacettepe University, Ankara, Turkey; email:pelinv@hacettepe.edu.tr.*
[3] *Okan University, Department of Banking and Finance, Istanbul,Turkey, erdinc.telatar@okan.edu.tr.*

some developed countries, using not only causality relationship but also VAR framework, with mixed results as presented in the relevant section.

The aim of the paper is to explore the causality between the budget deficits and the current accounts of the balance of payments for seven Central and Eastern European (CEE) economies, namely Bulgaria, Latvia, Lithuania, Poland, Romania, Serbia and Slovenia. The twin deficits phenomenon is crucial for the CEE countries, since they have experienced both budget and current account imbalances in the process of transition to the market economy. As methodology; bounds testing procedure of Pesaran, Shin, and Smith (2001) is implemented in that it analyzes the long-run twin deficits relation irrespective of whether the underlying variables are I(0), I(1) or mutually cointegrated. Successively, error correction mechanisms are derived through the long-run autoregressive distributed lag (ARDL) models to examine the existence and direction of Granger non-causality for the variables in question.

The remainder of the paper is organized as follows. Firstly, we mention the overview of the sample CEE economies. Further, we illustrate the theoretical foundations of the twin deficits relation. Following, the review of empirical literature is presented. After describing the data and methodology, the empirical results are reported. Finally, the concluding remarks are presented.

1. Overview of the Developments in the Budget Balance and Current Account Balance of Sample CEE Economies

The discussion of the macroeconomic issues for the CEE economies is inevitably associated with the process of transition from a centrally-planned to a market economy and the reforms that have led to changes in institutional, structural and behavioral perspectives. The patterns in public revenues and expenditures reflect local factors, as well as the guidance of institutions such as the International Monetary Fund and the World Bank (Svejnar, 2002; Aristovnik, 2005). Thus, within the transition to the market economy, tax and expenditure policies have changed so as to be efficient, restrain government intervention and maintain the budget balance (Tanzi and Tsibouris, 2001). However, as presented in Table 1, the sample countries have experienced large deficits, especially after 1998, due to the significant government expenditures and the decline in government revenues as a result of the adoption of the value-added tax (VAT) with low initial rates in most CEE countries (Aristovnik, 2005). Although the extent of the fiscal deficit problem has differed within the sample countries, all have entered the 2008 crisis with budget deficits, except the Bulgarian economy that recorded a budget surplus of 2.9% in 2008.

Another important aspect of the fiscal deficits encapsulates the accumulation of arrears in the CEE economies, especially in Romania during the transition period. As Rădulescu (2003) states, these arrears have arisen from the economic policy in the 1980s, which imposed high tax rates on the enterprises to repay the external debt through the budget surplus. As a source of financing, firms have appealed to bank credits, which became in time “bad debt” associated with the financial distress that would not be paid on short or medium term (Pelinescu, 2013). This problem that has

deepened after 1989 reached to today by passing through different periods, finally through the 2008 global crisis. Irrespective of the source or the development of the arrears, it is obvious that they have led to economic instabilities, such as output shocks, inflation, external imbalances, etc.

Table 1

The Budget and Current Account Balance in Selected CEE Economies

General Government Balance/GDP					
	1998-2002	2003-2007	2008	2009	2010
Bulgaria	0.7	2.2	2.9	-3.9	-3.8
Latvia	-1	-0.8	-4.1	-10.2	-8
Lithuania	-2.9	-0.9	-3.3	-9.2	-7.2
Poland	-3.9	-2	-3.7	-7.2	-7.5
Romania	-3.6	-1.7	-5.4	-7.4	-6.8
Serbia	-3.5	0.2	-2.6	-4.2	-4.8
Slovenia	-2.3	-1.5	-1.8	-5.8	-5.7
Current account balance/GDP					
	1998-2002	2003-2007	2008	2009	2010
Bulgaria	-5	-13.7	-23.9	-9.6	-3
Latvia	-7.5	-15.7	13.3	8.8	5
Lithuania	-7.7	-9.3	-13.5	4.5	-2.1
Poland	-4.7	-3.1	-5.1	-1.7	-2.2
Romania	-4.7	-7.3	-11.9	-4.5	-5.1
Serbia	-2.9	-9	-17.9	-15.7	-5.6
Slovenia	-1.3	-2.5	-6.1	-1	-1

Note: The table is arranged as averages over the period 1998-2007. However, the data after 2008 is given directly, so that the effects of both the 2008 crisis and the policy measures on fiscal and current account balance could be examined more accurately.

Source: EBRD (http://www.ebrd.com/pages/research/economics/data/macro).

Table 1 also indicates that the transition process involving the current-account convertibility and liberalization of foreign trade regime was accompanied by significant current account deficits, mostly above 5% of GDP. The reason is that at the beginning of the transition period, the national investment rose, while low saving rates relative to GDP occurred as a result of the output fall, the rise in inflation and unemployment leading to uncertainty. In such a condition, the capital inflows, thus current account deficits have been experienced in order to smooth consumption over time and finance much-needed capital projects (Aristovnik, 2006; McGettigan, 2000). Furthermore, the current account deficits have reached the peak rate in 2008 for the sample of CEE countries, except for Latvia, as a result of the global crisis. For instance, in Bulgaria, Lithuania, Poland, Romania, Serbia and Slovenia, the current account deficits as a percent of GDP rose to 23.9%, 13.5%, 5.1%, 11.9%, 17.9% and 6.1%, respectively. However, a relative improvement in the current account balance was afterwards

experienced, since the recession all over the Europe restrained the capital flows and foreign trade.

The EU membership, in addition to the elimination of the government intervention on the foreign trade and capital movement, made the CEE countries, experiencing market economy very recently, more vulnerable to external shocks. The recession in Europe during 2009 has significantly affected the CEE economies which entered the crisis with structural imbalances, such as budget deficits, dependency on foreign capital flows and direct investment, and hence, current account deficits. However, the impact of the crisis differed within the CEE countries. Zaidi and Rejniak (2010) assert that Poland, which had relatively more developed financial markets, experienced a fall in GDP, but a negative growth rate was not recorded, unlike the other countries. On the other hand, for Latvia and Lithuania, a sharp decline in GDP, exceeding 15%, was experienced as a result of the small-scale domestic economies. The crisis has caused a rise in inflation and private sector external debt, and domestic demand contraction for Bulgaria, which has pegged its national currency to the euro. However, high foreign exchange reserves and fiscal surplus (see Table 1) have prevented the economic devastation to a certain extent. Unlike Bulgaria, Romania had a budget deficit rather than the budget surpluses that generates a potential risk for future. Besides, Romania has experienced recession, increase in the cost of external financing and national currency depreciation, as well as high unemployment and social exclusion (Socol and Soviani, 2010; Zaidi and Rejniak, 2010). Comparing to Bulgaria and Romania, Zaman (2011) suggests that the Serbian economy remained more stable.

The fiscal stimulus packages that were introduced to stimulate the CEE economies out of recession have led to a significant deterioration in the government debt and deficit. However, the extent of the fiscal stimulus policies and resultant effects has exhibited variations across the CEE countries. For instance, Poland has implemented the most generous fiscal stimulus package among the CEE countries, which has ended up in a rise in the budget deficit (7.2% in 2009 and 7.5% in 2010) and GDP growth. Bulgaria has put forward austerity measures as well as fiscal stimulus in order to maintain the fiscal balance in accordance with the plans regarding Eurozone membership. On the other hand, since Latvia and Lithuania could not afford a fiscal stimulus due to the budget deficits around 10% in 2009, the austerity measures and spending cuts were implemented to reach the IMF requirement of fiscal correction and get financial aid. Besides, Romania has imposed strict austerity measures, such as wage cuts and significant rises in tax rates to reduce the budget deficit to 6.8% of GDP in 2010 in return for the loan received from the IMF and EU in 2009 (Socol and Soviani, 2010; Zaidi and Rejniak, 2010).

Section 4 aims to examine empirically the twin deficit relation that is crucial for the CEE economies. Hence, the transition process and the 2008 crisis have left economies suffering budget and current account imbalances. If the empirical results support the twin deficit relation, it could be asserted that fiscal adjustment as a policy response to the adverse effects of the crisis and the requirements of the EU would also contribute to solve the current account imbalances.

2. Theoretical Background

The logic behind the twin deficits is threefold[4]. First view claims that in an open economy the fiscal stimulus - if non-monetized - would worsen the current account balance due to the high interest rates putting upward pressure on the foreign exchange rates. According to the second view, not only the real interest rate transmission mechanism but also the nominal income dynamics lead to the causality from budget to current account deficits. More briefly, the current account deficits are explained on the grounds of higher budget deficits generating higher nominal income. The final view reveals that twin deficits hypothesis stems from the interaction between saving and investment derived via the national income identity. The saving-investment relationship is expressed by the following equation:

$$(S^p-I^p)+(T-G)=NX \quad (1)$$

where: S^p, I^p, T, G and NX denote private saving, private investment, taxes, government expenditures and net exports, respectively.

The current account balance that is assumed to be equal to the net exports is defined as the sum of the saving gaps in the private and public sectors. Feldstein and Horioka (1980) investigate the degree of capital mobility through the saving-investment association in (1). In a closed economy with zero capital mobility, the co-movement of budget and current account deficit does not occur as a result of the domestic savings financed through domestic investment without the need of borrowing from abroad. Conversely, in an open economy the identity reflects the relationship between three deficits, which are the private sector, public sector and current account deficits. In this context, the twin deficits hypothesis implies that a rise in government deficit would end up with a one-to-one augmentation in the current account deficit provided that the private sector balance is held constant. Contrary to the hypothesis, the Ricardian equivalence theorem asserts the absence of the budget and current account deficit relationship since a decrease in government saving is offset by a rise in private saving.

3. Review of Empirical Literature on the Twin Deficit Hypothesis

There are several studies in the literature which aimed to test the twin deficits hypothesis. The related literature can be classified into two groups according to the methodology. The first group of studies applies co-integration and causality tests, while the second group implements vector autoregressive (VAR) models. Beside the classification of the literature regarding the methodology, the early studies on the CEE economies are reviewed, so that our empirical results could be comparable.

[4] *For a detailed discussion of the these theoretical explanations, see, Darrat (1988), Rosensweig and Tallman (1993); Dibooğlu (1997); Anoruo and Ramchander (1998); Fidrmuch (2003); Baharumshah, Lau and Khalid (2006); Kim and Kim (2006); Salvatore (2006); Daly and Siddiki (2009); Bagnai (2010), Lau, Mansor and Puah (2010).*

The literature employing co-integration and causality analysis concludes with four different results, which are: the absence of the long–run relationship and non-causality (Rahman and Mishra, 1992), bi-directional causality (Darrat, 1988; İslam, 1998; Mukhtar, Zakaria and Mehboob, 2007); budget deficits as the determinant of current account deficits (Latif-Zaman and DaCosta, 1990; Vamvoukas, 1999; Leachman and Francis, 2002; Bagnai, 2006) and, eventually, reverse causality from external to internal deficits (Kim and Kim, 2006; Onafowora and Owoye, 2006; Marinheiro, 2008; Katırcıoğlu, Fethi and Fethi, 2009). On the other hand, the studies applying the same methodology to different group of countries and periods obtain varying results throughout the sample (Kulkarni and Erickson, 2001; Hatemi-J and Shukur, 2002; Kouassi, Mougoue and Kymn, 2004; Baharumshah, Lau and Khalid, 2006; Papadogonas and Stournaras, 2006; Baharumshah and Lau, 2009; Daly and Siddiki, 2009)[5].

Among the studies using VAR analysis, some supports the twin deficits hypothesis (Abell, 1990; Kearney and Monadjemi, 1990; Bachman, 1992; Rosensweig and Tallman, 1993; Dibooğlu, 1997; Normandin, 1999; Beetsma, Giuliodori and Klaassen, 2008); while others end up with confronting results as the validity of twin divergence[6] (Kim and Roubini, 2008), Ricardian equivalence theorem (Enders and Lee, 1990) and the reverse effect from current account deficit to budget deficit (Mohammadi and Skaggs, 1996; Siddiqui, 2009). Besides, varying results for different group of countries and time periods also exist in the literature on VAR framework (Anoruo and Ramchander, 1998; Hashemzadeh and Wilson, 2006; Grier and Ye, 2009).

Despite of the wide literature on the twin deficits relation, only a few studies address the CEE economies. As a relatively early study, Fidrmuch (2003) uses 1990-2001 data for three CEE countries (Hungary, Poland and Slovakia) in the co-integration testing procedure that concludes with the evidence of long-run relationship between fiscal and external balance. Using a panel of 8 CEE countries, namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia over the period 1994Q1-2004Q4, Herrmann and Jochem (2005) confirm the twin deficits hypothesis, even though the budget deficit is found to be financed by the private savings. Aristovnik (2006) investigates the empirical link between the deficits of the CEE economies (the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia) in the 1990-2003 period via the estimates of various model specifications. The empirical results support the statistically significant, but weak relationship between the budget and current account deficits. Bagnai (2010) also finds a weak interaction between the deficits in the CEE economies over the period 1995-2006. Afonso and Rault (2009) use the unbalanced panels including Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia within the period 1970-2007 for the SUR analysis and panel Granger non-causality test. According to the empirical results, twin deficits hypothesis is found to be valid for

[5] *A few studies consider the effects of structural breaks on the budget balance and current account balance relation across the literature applying cointegration, causality analysis (Bagnai, 2006; Hatemi-J and Shukur, 2002; Daly and Siddiki, 2009; Baharumshah and Lau, 2009) and VAR methodology such as Grier and Ye (2009). For a brief discussion of the regarding literature, see Varol iyidoğan (2013).*

[6] *The terminology of "twin divergence" implies the negative causality from budget to current account balance.*

7 CEE countries, namely Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovakia. As a case study, Ganchev (2010) analyzes the twin deficits issue for the Bulgarian economy in a short period of 2000-2010. The Granger non-causality tests confirm the effect of fiscal deficits on the current account deficit, while the VAR procedure shows that higher fiscal surpluses are associated with higher current account deficits. Recently, Ketenci and Uz (2010) find evidence of twin deficits relation for the Czech Republic, Latvia, Lithuania, Slovenia and Slovakia by employing the bounds testing approach to cointegration in order to determine the major determinants of current account balance in 8 new members of the EU (Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovenia and Slovakia) over the period 1995Q1-2008Q3. More recently, Ganchev, Stavrova and Tsenkov (2012) employ panel data and VAR analysis on a sample of CEE countries including Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) for the period 1998-2009. The results of panel data analysis confirm the existence of positive relationship between budget and current account balance, with the exception of Bulgaria and Estonia, where the relation is negative. Contrary, the VAR analysis indicates the strong impact of current account balance on the budget balance.

More briefly, the empirical findings of the studies mentioned above diversify according to the countries, time period and methodology. Although our study stems from this wide literature, it is different in that the twin deficits relationship is firstly analyzed by means of bounds testing and Granger non-causality analysis based on the ARDL specification for the selected CEE economies via a recent data set of 1990Q1-2013Q4. The empirical investigation of the fiscal and current account balance relation is crucial for this group of countries, since they have experienced an economic transformation process as a result of the transition to the market economy and globalization.

4. Data and Methodology

In examining the budget balance and current account balance interaction, basically two series, current account balance/GDP and budget balance/GDP, for the Central and Eastern European economies, are used in this study. The details concerning the available quarterly data for the related series of selected countries are presented in the Appendix.

Prior to the causality analysis, the study examines the co-integration relation between current account and budget balance by means of the bounds testing approach developed by Pesaran, Shin, and Smith (2001). Contrary to the conventional methods, as Engle and Granger (1987), Johansen (1991, 1995), this approach to co-integration tests the long-run relationship irrespective of the integration order of the series. The method is based on the estimation of a conditional error correction version of the ARDL model. The conditional error correction models (ECM) below correspond to the three special cases which are suggested by Pesaran, Shin and Smith (2001). Among these models with different trend characteristics, (2) points out the case without trend while (3) and (4) reflect the cases with trend. The models based on the twin deficits relationship are,

Case III) unrestricted intercept and no trend case

$$\Delta ca_t = \alpha_0 + \beta_1 ca_{t-1} + \beta_2 bb_{t-1} + \sum_{i=1}^{p} \delta_i \Delta ca_{t-i} + \sum_{i=0}^{p} \phi_i \Delta bb_{t-i} + u_t$$
$$H_0(null\,hypothesis): \beta_1 = \beta_2 = 0 \quad (2)$$

Case IV) unrestricted intercept and restricted trend case

$$\Delta ca_t = \alpha_0 + \alpha_1 t + \beta_1 ca_{t-1} + \beta_2 bb_{t-1} + \sum_{i=1}^{p} \delta_i \Delta ca_{t-i} + \sum_{i=0}^{p} \phi_i \Delta bb_{t-i} + u_t$$
$$H_0(null\ hypothesis): \alpha_1 = \beta_1 = \beta_2 = 0 \quad (3)$$

Case V) unrestricted intercept and unrestricted trend case

$$\Delta ca_t = \alpha_0 + \alpha_1 t + \beta_1 ca_{t-1} + \beta_2 bb_{t-1} + \sum_{i=1}^{p} \delta_i \Delta ca_{t-i} + \sum_{i=0}^{p} \phi_i \Delta bb_{t-i} + u_t$$
$$H_0(null\ hypothesis): \beta_1 = \beta_2 = 0 \quad (4)$$

where: α_0 is the drift component, t is the deterministic trend, p is the order of the VAR system from which the conditional ECM is derived, Δ is the first-difference operator and u_t are white noise errors.

Following Pesaran, Shin, and Smith (2001), the absence of a level relationship is tested in two ways for each of the cases. One is a F-test for the joint significance of the related coefficients which tests each of the assumptions above and the other one is a t-test of Banerjee, Dolado and Mestre (1998) for the null hypothesis of $H_0: \beta_1 = 0$. The asymptotic distributions of these statistics are non-standard. Both tests involve two sets of asymptotic critical values, one of which refers to the purely I(0) regressors and the other to the purely I(1) regressors. Critical values for the I(0) and I(1) series are mentioned as lower and upper critical value bound, respectively. If the F- or t-statistic exceeds the upper bound, it would be concluded that there is evidence of a long-run relationship in levels between the variables in question. An F- or t- statistic below the lower bound provides evidence for the non-rejection of the null hypothesis of no co-integration. If the statistics lie between the bounds, inference would be inconclusive. The long-run parameters being derived from the ARDL (p,q) model in (5) and the short-run vector error correction models (VECM) in (6) and (7) are estimated for the countries which are found to have a long-run relationship between the deficits with regard to the bounds testing procedure.

$$ca_t = \omega_1 + \sum_{i=1}^{p} \lambda_i ca_{t-i} + \sum_{j=0}^{q} \phi_j bb_{t-j} + e_{1t} \quad (5)$$

The vector error correction models (VECM) for the selected ARDL models pointing out the short-run dynamics are generated to investigate the direction and the sign of the causal relationship among the variables. The error correction terms in (6) and (7), which should be significant and negative in sign, show the speed of adjustment to

equilibrium. The VECM leading to the Granger non-causality analysis between the deficits is as follows:

$$\Delta ca_t = \alpha_1 + \sum_{i=1}^{m} \mu_i \Delta ca_{t-i} + \sum_{j=0}^{m} \delta_j \Delta bb_{t-j} + \beta_1 e_{1t-1} + u_{1t} \quad (6)$$

$$\Delta bb_t = \alpha_2 + \sum_{i=1}^{n} \omega_i \Delta bb_{t-i} + \sum_{j=0}^{n} \gamma_j \Delta ca_{t-j} + \beta_2 e_{2t-1} + u_{2t} \quad (7)$$

As the succeeding step in the methodology; the existence and direction of causality are examined by testing the null hypothesis presented in Table 2, while the sign is determined by the sum of the coefficients indicated below:

Table 2

The Granger Non-causality

Null hypothesis	Causality: rejection of H_0	Sign of causality
$H_0 : \delta_j = 0,$ for all j=0,…,m (Eq. 6)	$bb_t \Rightarrow ca_t$	$\sum_{j=0}^{m} \delta_j$ <0→ (-) causality $\sum_{j=0}^{m} \delta_j$ >0→ (+) causality
$H_0 : \gamma_j = 0,$ for all j=0,…,n (Eq.7)	$ca_t \Rightarrow bb_t$	$\sum_{j=0}^{n} \gamma_j$ <0→ (-) causality $\sum_{j=0}^{n} \gamma_j$ >0 → (+) causality

5. Empirical Results

Prior to the implementation of bounds testing procedure, we analyze the integration orders of the variables[7]. The order of integration for the series is determined by means of three different types of unit root tests. While the KPSS procedure developed by Kwiatkowski, Philips, Schmidt and Shin (1992) tests the null hypothesis of stationarity, the Augmented Dickey Fuller (ADF) test of Dickey and Fuller (1979) and the Philips-Perron (PP) test suggested by Philips and Perron (1988) treat stationarity as the alternative hypothesis. Though the unit root results for the countries are not presented, two common conclusions are drawn concerning the stationarity of the series. Firstly, since the test results show that the variables are not integrated of the same order, employing traditional co-integration methods as of Engle and Granger

[7] *Though the results concerning the stationarity analysis are not reported to save space, they can be provided upon request.*

(1987) appears to be inconvenient. Secondly, there is uncertainty in the order of integration, due to the different testing procedures and significance levels. Since the order of integration for the variables cannot be determined efficiently, we analyze the co-integration between investment and saving by the means of bounds testing approach developed by Pesaran, Shin, and Smith (2001), which involves the levels of the variables irrespective of whether they are purely I(0), purely I(1), or mutually co-integrated.

The first step in the bounds testing procedure is to determine the appropriate lag length (p) by means of the selection criterion and the diagnostic checking of autocorrelation. Thus, we select the optimal lag length, p, which is also suggested by the Lagrange Multiplier statistics and the Schwarz Bayesian Criteria (SBC). The optimal lag lengths for the models with and without trend which have minimum SBC values and no first and fourth order autocorrelation are chosen with regard to Table 3.

Table 3

Lag Order Selection for the Bounds Testing

	1		2		3		4	
	T (+)	T(-)	T (+)	T(-)	T (+)	T(-)	T (+)	T(-)
Country								
Bulgaria	6.541	6.509	6.574	6.548	**6.483**	**6.466**	6.539	6.506
	3.607***	2.638***	1.878	2.659	**0.005**	**0.003**	0.647	0.273
	10.801**	11.130**	16.069*	15.715*	**1.866**	**2.308**	4.425	4.902
Latvia	4.806	4.863	4.743	**4.797**	**4.841**	4.924	5.057	5.150
	2.348	3.850**	4.909**	**3.651**	**0.034**	0.084	1.054	4.444**
	11.797**	9.030	7.758	**8.539**	**8.194**	7.106	8.655	10.132**
Lithuania	5.995	6.085	6.115	6.085	6.146	6.108	**5.908**	**5.918**
	0207	5.425**	3.487	5.425**	8.859	10.378*	**0.367**	**0.001**
	25.487*	22.024*	21.315*	22.170*	11.771**	14.523*	**5.413**	**5.106**
Poland	**3.207**	**3.150**	3.306	3.247	3.418	3.361	3.554	3.496
	1.562	**1.675**	0.194	0.190	0.431	0.346	0.464	0.256
	3.265	**3.037**	1.917	1.666	1.701	1.309	5.349	4.934
Romania	**5.088**	**5.040**	5.165	5.116	5.234	5.188	5.238	5.193
	2.815	**2.837**	0.103	0.098	1.947	1.555	0.000	0.000
	5.828	**5.757**	8.800	8.598	8.307	8.392	4.113	3.659
Serbia	**-2.219**	**-2.308**	-2.021	-2.145	-1.758	-1.877	-1.588	-1.721
	0.142	**0.807**	0.313	0.243	1.039	1.001	6.882*	6.884*
	0.646	**1.732**	4.343	3.057	10.177**	8.587	15.151*	13.095**
Slovenia	4.055	3.981	**4.027**	**3.979**	4.196	4.150	4.337	4.314
	1.639	1.087	**0.106**	**0.528**	0.045	0.680	1.427	1.130
	2.827	2.548	**1.943**	**1.299**	4.389	1.684	3.586	1.894

Notes: *The values in the table indicate SBC selection criteria and the LM statistics* $\chi^2_{SC}(1)$ $\chi^2_{SC}(4)$, *respectively for the models with and without trend shown by T(+) and T(-) * and ** show the significance at %1 and %5 significance levels. The values in bold correspond to the selected lags.*

In the next step of methodology, we compare the computed t and F statistics for the estimated conditional ECMs in (2)-(4) with the lag lengths determined via Table 3 to the lower and upper bounds of Pesaran, Shin, and Smith (2001). The results, including the three special cases mentioned above, are presented in Table 4.

Table 4

Co-integration Test Results

Country	P	F_{IV}	F_V	t_V	F_{III}	t_{III}
Bulgaria	3,3	8.563[b]	12.755[a]	-4.448[a]	11.308[a]	-4.447[a]
Latvia	3,2	2.801[c]	4.044[c]	-2.055[c]	0.679[c]	-0.684[c]
Lithuania	4,4	4.121[c]	5.866[c]	-2.284[c]	3.881[c]	-2.630[c]
Poland	1,1	4.133[c]	5.302[c]	-3.243[c]	6.227[b]	-3.525[b]
Romania	1,1	2.712[c]	4.057[c]	-2.684[c]	4.099[c]	-2.774[c]
Serbia	1,1	3.283[c]	4.861[c]	-2.958[c]	4.670[c]	-2.017[c]
Slovenia	2,2	1.542[c]	0.476[c]	-0.091[c]	1.670[c]	-0.095[c]

Notes: (1) *p values indicate the appropriate lag lengths for the models with and without trend, respectively, which are selected by SBC and LM serial correlation tests as reported in Table 3.* ***(2)*** *Although the critical values of Pesaran, Shin, and Smith (2001) are not presented above, the results obtained by the comparison of the test statistics and the lower-upper bounds are denoted by the small letters; a shows the presence of co-integration at 1% significance level while b does at 5% level. Contrarily, c indicates the absence of a long-run level relationship or means that the statistic lies within the bound of inconclusiveness.*

According to the results given above, there is no evidence of a long-run current account and budget balance relationship for all countries, except for Bulgaria in all cases and Poland just in case 3. This empirical result is somewhat contradictory to the early studies for the CEE economies that mostly support the validity of twin deficits hypothesis (see section 3). Moreover, considering the arrears in the CEE economies, especially Romania as mentioned in the first section, the budget balance and the current account balance are expected to move together, since the burden of the arrears on the budget has led to external borrowing. However, in our opinion this conflicting result of no long-run relationship could be attributed to the other economic determinants of the current account balance, such as the exchange rate dynamics, growth rate, etc., which are more effective rather than the fiscal balance. Regarding the growth and external balance relation, as Santarossa (2001) states, the negative impact of the arrears on the financial markets alleviates the growth performance and reveals inflationary effects, which lead to current account fluctuations.

Following the result in favor of the existence of co-integration for Bulgaria and Poland, the Granger non-causality is investigated through the short-run analysis. For this purpose, we estimate two models which are the long-run ARDL model and the short run error correction models as in (5)-(7). In the estimation procedure, the appropriate lag lengths are selected by means of SBC selection criteria and LM serial correlation tests. In this context, Tables 5 and 6 present the estimated coefficients of ARDL and ECM models for the budget balance and the current account balance together with the standard errors and the t-statistics.

Table 5

Long-Run Coefficient Estimates of ARDL Models

Panel I (Bulgaria) Estimated long-run coefficients from ARDL (4,2) Dependent variable: ca			
Regressor	*Coefficient*	*Standard error*	*t-stat (prob)*
bb	-1.7799	0.58156	-3.0605 (0.003)
intercept	-13.3626	6.4620	-2.0679 (0.042)
trend	0.10302	0.10583	0.97345 (0.333)
Estimated long-run coefficients from ARDL (1,0) Dependent variable: bb			
ca	-0.083931	0.11633	-0.72150 (0.473)
intercept	-6.3753	2.4112	-2.6440 (0.010)
trend	0.084871	0.043905	1.9331 (0.057)
Panel II (Poland) Estimated long-run coefficients from ARDL (1,0) Dependent variable: ca			
bb	-0.26058	0.12914	-2.0177 (0.048)
intercept	-7.2695	1.5499	-4.6904 (0.00)
trend	0.024285	0.022797	1.0653 (0.291)
Estimated long-run coefficients from ARDL (1,0) Dependent variable: bb			
ca	-0.91260	0.87761	-1.0399 (0.302)
intercept	-14.3697	5.1704	-2.7792 (0.007)
trend	0.094031	0.080077	1.1743 (0.244)

According to the long-run coefficients in Table 5, the budget balance was found to have a statistically significant and negative effect on the current account balance in both Bulgaria and Poland. We can interpret the result of twin divergence for Bulgaria as reflecting the long run effects of the currency board regime implementation (Ganchev, Stavrova and Tsenkov, 2012). Moreover, following Ganchev (2010), the current global crisis revealing a positive impact on the current account deficit, while a negative one on the budget balance, could lead to the deterioration in the budget balance that is associated with an improvement in the current account balance. On the other hand, from an economic point of view, our long- run finding for Poland could arise from the large domestic market and well-capitalized and profitable banking system which alter the effect of budget deficits on the current account balance through the stimulation of private savings. More briefly, the saving gap in the public sector could be neutralized by the private sector surplus that leads to an improvement in the current account balance. Thus, for economies such as Poland that have developed financial systems, the twin deficits hypothesis becomes implausible, since the budget deficits could be financed through the domestic private savings rather than the current account deficits (Herrman and Jochem 2005; Kohler 2005; Grier and Ye 2009; Ganchev, Stavrova and Tsenkov 2012).

Table 6

Error Correction Representation for the Selected ARDL Models

Panel I (Bulgaria) ECM for ARDL (4,2) Model Dependent variable: Δca			
Regressor	*Coefficient*	*Standard error*	*t-stat (prob)*
intercept	-3.6315	1.5075	-2.4090 (0.018)
trend	-0.027997	0.025943	1.0792 (0.284)
Δca(-1)	-0.43953	0.10642	-4.1299 (0.00)
Δca(-2)	0.16170	0.11239	1.4388 (0.154)
Δca(-3)	0.27587	0.090677	3.0424 (0.003)
Δbb	0.042599	0.12144	0.35077 (0.727)
Δbb(-1)	0.47674	0.12557	3.7966 (0.00)
ecm(-1)	-0.27176	0.070060	-3.8790 (0.00)
ECM for ARDL (1,0) Model Dependent variable: Δbb			
intercept	-3.0100	1.3028	-2.3105 (0.023)
trend	0.040070	0.022015	1.8201 (0.072)
Δca	-0.039626	0.057055	-0.69453 (0.489)
ecm(-1)	-0.47213	0.097349	-4.8499 (0.00)
Panel II (Poland) ECM for ARDL (1,0) Model Dependent variable: Δca			
intercept	-2.1473	0.68910	3.1161 (0.003)
trend	0.0071736	0.006674	1.0749 (0.286)
Δbb	-0.07697	0.041302	-1.8636 (0.067)
ecm(-1)	-0.29536	0.084427	-3.4987 (0.001)
ECM for ARDL (1,0) Model Dependent variable: Δbb			
intercept	-2.0516	1.0246	-2.0024 (0.049)
trend	0.013425	0.010131	1.3251 (0.190)
Δca	-0.13029	0.13455	-0.96834 (0.336)
ecm(-1)	-0.14277	0.068395	-2.0874 (0.041)

After the long-run analysis of the budget and current account balance relation, we report the results regarding the short-run dynamics in Table 6. The sign and the significance of the short-run coefficients coincide with the long-run parameters for Poland, while the short and long-run effects of the budget balance on the current account balance differ for the Bulgarian economy, as also reflected by the causality results in Table 7. On the other hand, the error correction terms derived from the long-run models have negative sign and are significant, as expected, which imply the adjustment of short-run shocks to the long-run equilibrium.

Table 7

Granger Non-causality Results

Panel I: Bulgaria				
	Wald test statistic (prob.)	Causality	(+) causality	(-) causality
Current account balance→Budget balance	0.48238 (0.487)	×	×	×
Budget balance→Current account balance	14.6039 (0.001)	✓	✓	×
Panel II: Poland				
Current account balance→Budget balance	0.93769 (0.333)	×	×	×
Budget balance→Current account balance	3.4730 (0.062)	✓	×	✓

Finally, Table 7 presents the causality between the budget balance and the current account balance. According to those results, we find evidence of negative causality running from the budget balance to the current balance for Poland as captured by short and long-run models. However, for Bulgaria we conclude with the validity of the twin deficits hypothesis contrary to the long-run model. A proper explanation for the short-run positive causality may be due to the dependency of Bulgarian economy on foreign capital inflows to finance the saving gap both in private and public sectors. Moreover, in parallel with our result, the austerity measures that were implemented after the 2008 crisis to decline budget deficit have also contributed to a fall in the current account deficits in 2010, as presented in Table 1.

6. Conclusion

The Central and Eastern European economies experience contemporaneous rise in budget and current account deficits due to the transition process. Our study attempts to provide empirical evidence regarding the validity of the twin deficits phenomenon for Bulgaria, Latvia, Lithuania, Poland, Romania, Serbia and Slovenia. As the preliminary step of the methodology, we employ the bounds testing approach of Pesaran, Shin, and Smith (2001), since the stationary test results do not allow employing traditional co-integration techniques. The bounds testing procedure enables to analyze the long-run relationship irrespective of the order of series. After detecting the co-integration, the existence and the direction of the causality are examined by means of Granger-non causality tests through the ECMs derived from ARDL long-run models.

The results provide evidence supporting the long-run relationship between budget and current deficits only for Bulgaria and Poland. However, the twin deficits relation implying positive causality from budget balance to current account balance is only confirmed for Bulgaria in the short-run. Thus, we can conclude that the efforts aiming

to solve the current account imbalances through fiscal policy implementations are inefficient.

However, since the dynamics of internal and external balances are complicated, some other aspects of the related interaction should also be considered. In this framework, the absence of the twin deficits relation can exist due to the saving-investment association in the private sector. More clearly, if deterioration in the budget balance is offset by an improvement in the saving-investment balance of the private sector, the current account balance would not alter. On the other hand, the current account balance of the transition economies in the study depends not only on the budget balance, but also on the real interest rate and growth path of the economy. Therefore, these emphasized issues should also be considered for further research.

References

Abell, J.D., 1990. Twin Deficits During the 1980's: An Empirical Investigation. Journal of Macreconomics, 12(1), pp. 81-96.

Afonso, A. and Rault, C., 2009. Bootstrap Panel Granger-Causality Between Government Budget and External Deficits for the EU. CESifo Working Paper, 2581.

Anoruo, E. and Ramchander, S., 1998. Current Account and Fiscal Deficits: Evidence From Five Developing Economies of Asia. Journal of Asian Economics, 9(3), pp. 487-501.

Aristovnik, A., 2005. Twin Deficit Hypothesis and Horioka-Feldstein Puzzle in Transition Economies. International Finance 0510020, EconWPA, pp.1-20.

Aristovnik, A., 2006. The Determinants and Excessiveness of Current Account Deficits in Eastern Europe and the Former Soviet Union. William Davidson Institute Working Paper, 827.

Bachman, D.D., 1992. Why Is the Current Account Deficit So Large? Evidence From Vector Autoregressions. Southern Economic Journal, 59(2), pp. 232-240.

Bagnai, A., 2006. Structural Breaks and the Twin Deficit Hypothesis. International Economics and Economic Policy, 3, pp. 137-155.

Bagnai, A., 2010. Twin Deficits in CEEC Economies: Evidence From Panel Unit Root Tests. Economics Bulletin, 30(2), pp. 1-9.

Baharumshah, A.Z. and Lau, E., 2009. Structural Breaks and the Twin Deficits Hypothesis: Evidence From East Asian Countries. Economics Bulletin, 29(4), pp.2517-2524.

Baharumshah, A.Z. Lau, E. and Khalid, A.M., 2006. Testing Twin Deficits Hypothesis Using VARs and Variance Decomposition. Journal of the Asia Pacific Economy, 11(3), pp. 331-354.

Banerjee, A. Dolado, J.J. and Mestre, R., 1998. Error-Correction Mechanism Tests for Co-integration in a Single-Equation Framework. Journal of Time Series Analysis, 19(3), pp. 267-283.

Beetsma, R. Giuliodori, M. and Klaassen, F., 2008. The Effects of Public Spending Shocks on Trade Balances and budget deficits in the European Union. Journal of the European Economic Association,6(2-3), pp. 414-423.

Daly, V. and Siddiki, J., 2009. The Twin Deficits in OECD Countries: Cointgration Analysis With Regime Shifts. Applied Economics Letters, 16(11), pp.1155-1164.

Darrat, A.F., 1988. Have Large Budget Deficits Caused Rising Trade Deficits. Southern Economic Journal, 54(4), pp. 879-887.

Dibooglu, S., 1997. Accounting for US Current Account Deficits: An Empirical Investigation. Applied Economics, 29, pp.787-793.

Dickey, D.A. and Fuller, W.A., 1979. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74, pp.427-431.

EBRD Data base, http://www.ebrd.com/pages/research/economics/data/macro/ Accessed on November 2012.

Enders, W. and Lee, B.S., 1990. Current Account and Budget Deficits: Twins or Distant Cousins. The Review of Economics and Statistics, 22(3), pp. 373-381.

Engle, R.F. and Granger, C.W.J., 1987. Co-integration and Error Correction: Representation, Estimation and Testing. Econometrica, 55(2), pp. 251-276.

Feldstein, M. and Horioka, C., 1980. Domestic Saving and International Capital Flows. The Economic Journal, 90, pp.314-329.

Fidrmuc, J., 2003. The Feldstein-Horioka Puzzle and Twin Deficits in Selected Countries. Economics of Planning, 36, pp.135-152.

Ganchev, G., 2010. The Twin Deficit Hypothesis: The Case of Bulgaria. Financial Theory and Practice, 34(4), pp.357-377.

Ganchev, G.T., Stavrova E. and Tsenkov V., 2012. Testing the Twin Deficit Hypothesis: The Case of Central and Eastern European Countries. International Journal of Contemporary Economics and Administrative Sciences, 2(1), pp.1-21.

Gordon, R.J., 1986. U.S. Fiscal Deficits and World Imbalance of Payments. Hitotsubashi Journal of Economics, 27, pp. 7-41.

Grier, K. and Ye H., 2009. Twin Sons of Different Mothers: The Long and the Short of the Twin Deficits Debate. Economic Inquiry, 47(4), pp. 625-638.

Hashemzadeh, N. and Wilson, L., 2006. The Dynamics of Current Account and Budget Deficits in Selected Countries in Middle East and North Africa. International Research Journal of Finance and Economics, (5), pp.112-129.

Hatemi, J.A. and Shukur, G., 2002. Multivariate-based Causality Tests of Twin Deficits in the US. Journal of Applied Statistics, 29(6), pp. 817-824.

Herrmann, S. and Jochem, A., 2005. Determinants of Current Account Developments in the Central and East European EU Member States-Consequences for the Enlargement of the Euro Area. Bundesbank Discussion Papers, Series 1: Economic Studies 32/2005.

Islam, F.M., 1998. Brazil's Twin Deficits: An Empirical Examination. Atlantic Economic Journal, 26(2), pp. 121-129.

Johansen, S., 1991. Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models. Econometrica, 59(6), pp. 1551-1580.

Johansen, S., 1995. Likelihood-Based Inference in Cointegrated Vector Autoregressive Models. Oxford: Oxford University Press.

Katircioglu, S.T. Fethi, S. and Fethi, M.D., 2009. Twin Deficits Phenomenon in Small Islands: An Empirical Investigation By Panel Data Analysis. Applied Economics Letters, 16(15), pp. 1569-1573.

Kearney, C. and Monadjemi, M.M., 1990. Fiscal Policy and Current Account Performance: International Evidence on the Twin Deficits. Journal of Macroeconomics, 12(2), pp. 197-219.

Ketenci, N. and Uz, I., 2010. Determinants of Current Account in the EU: The Relation Between Internal and External Balances in the New Members. MPRA Paper, 27466.

Kim, C.-H., and Kim, D., 2006. Does Korea Have Twin Deficits?. Applied Economic Letters, 13(10), pp. 675-680.

Kim, S. and Roubini, N., 2008. Twin Deficit or Twin Divergence? Fiscal policy, Current Account and Real Exchange Rate in the U.S.?. Journal of International Economics, 74(2), pp. 362-383.

Kohler, M., 2005. International Capital Mobility and Current Account Targeting in Central and Eastern European Countries. Center for European Economic Research, Discussion Paper 05-51.

Kouassi, E. Mougoue, M. and Kymn, K.O., 2004. Causality Tests of the Relationship Between the Twin Deficits. Empirical Economics, 29(3), pp. 503-525.

Kulkarni, K. G. and Erickson, E.L., 2001. Twin Deficit Revisited: Evidence From India, Pakistan and Mexico. The Journal of Applied Business Research, 17(2), pp. 97-104.

Kwiatkowski, D. Philips, P.C.B. Schmidt, P. and Shin, Y., 1992. Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root. Journal of Econometrics, 54(1-3), pp. 159-178.

Latif-Zaman, N. and DaCosta, M.N., 1990. The Budget Deficit nd the Trade Deficit: Insights Into This Relationship. Eastern Economic Journal, 16(4), pp. 349-354.

Lau, E. Mansor, S.A. and Puah, C.-H., 2010. At the Crossroad: Twin Deficits in Asian Crisis-affected Countries. Economic Issues, 15(1), pp. 1-32.

Leachman, L.L. and Francis, B., 2002. Twin Deficits: Appariton or Reality?. Applied Economics, 34(9), pp. 1121-1132.

Marinheiro, C.F., 2008. Ricardian Equivalence, Twin Deficits, and the Feldstein-Horioka Puzzle in Egypt. Journal of Policy Modeling, 30(6), pp. 1041-1056.

McGettigan, D., 2000. Current Account and External Sustainability in the Baltics, Russia, and Other Countries of the Former Soviet Union. Occasional Paper 189, Washinghton DC: IMF.

McKinnon, R.I., 1980. Exchange Rate Instability, Trade Balances, and Monetary Policies in Japan, Europe, and the United States. In: P. Oppenheimer (Eds.), Issues in International Economics, Boston: Oriel Press, pp. 225-250.

Mohammadi, H. and Skaggs, N.T., 1996. Fiscal Policy and Trade Deficits: A Broad Perspective. Southern Economic Journal, 62(3), pp. 675-689.

Mukhtar, T. Zakaria, M. and Mehboob, A., 2007. An Empirical Investigation for the Twin Deficit Hypothesis in Pakistan. Journal of Economic Cooperation, 28(4), pp. 63-80.

Normandin, M., 1999. Budget Deficit Persistence and the Twin Deficit Hypothesis. Journal of International Economics, 49(1), pp. 171-193.

Onafowora, O.A. and Owoye, O., 2006. An Empirical Investigation of Budget and Trade Deficits: The Case of Nigeria. The Journal of Developing Areas, 39(2), pp. 153-174.

Papadogonas, T. and Stournaras, Y., 2006. Twin Deficits and Financial Integration in EU Member-States. Journal of Policy Modeling, 28(5), pp. 595-602.

Pelinescu, E., 2013. The Mechanisms of Arrears in Romania. Romanian Journal of Economic Forecasting, 16(2), pp.223-239.

Pesaran, M.H. Shin,Y. and Smith, R.J., 2001. Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16(3), pp. 289-326.

Philips, P.C.B., and Perron, P., 1988. Testing for a Unit Root in Time Series Regression. Biometrika, 75 (2), pp. 335-346.

Radulesco, D.M., 2003. An Assessment of Fiscal Sustaianbility in Romania. Post-Communist Economies, 15(2), pp. 259-275.

Rahman, M. and Mishra, B., 1992. Co-integration of U.S. Budget and Current Account Deficits: Twins or Strangers?. Journal of Economics and Finance, 16(2), pp. 119-127.

Rosensweig, J.A. and Tallman, E.W., 1993. Fiscal Policy and Trade Adjustment: Are The Deficits Really Twins?. Economic Inquiry, 31(4), pp. 580-594.

Salvatore, D., 2006. Twin Deficits in the G-7 Countries and Global Structural Imbalances. Journal of Policy Modeling, 28(6), pp. 701-712.

Santarossa, L.D., 2001. Arrears as a Sign of Financial Repression in Transition Economies. Centre for Economic Reform and Transformation, Discussion Paper 2001/4.

Siddiqui, A.H., 2009. Does Fiscal Deficit Influence Trade Deficit?. Economic Review, July-August.

Socol, C. and Soviani, R., 2010. Experiences of the Large Fiscal Adjustments in EU: Romania's Case. Theoretical and Applied Economics, 17(12), pp. 21-28.

Svejnar, J., 2002. Transition Economies: Performance and Challenges. The Journal of Economic Perspectives, 16(1), pp. 3-28.

Tanzi, V. and Tsibouris, G., 2001. Transition and Changing Role of Government. In: O. Havrylyshyn et al., Eds.), A Decade of Transition: Achievements and Challenges, IMF.

Vamvoukas, G.A., 1999. The Twin Deficits Phenomenon: Evidence From Greece. Applied Economics, 31(9), pp. 1093-1110.

Varol Iyidogan, P., 2013. Merkez ve Dogu Avrupa Ülkelerinde Bütçe Dengesi ve Cari Islemler Dengesi Iliskisi: Ekonometrik Bir Inceleme. Maliye Dergisi, 164, pp. 82-98.

Volcker, P. A., 1984. Facing Up to the Twin Deficits. Challenge, March/April: 4-9.

Zaidi, A. and Rejniak, M., 2010. Fiscal Policy and Sustainability in View of Crisis and Population Ageing in Central and Eastern European Countries. European Centre Vienna, Policy Brief Series.

Zaman, C., 2011. Assessing the Sustainability of Public Finances in Romania. Romanian Journal of Economic Forecasting, 14(2), pp. 106-115.

Appendix

The Sources of Data for Central and Eastern European Countries (Transition Economies)

Country	Time period	Data source
Bulgaria	1990:1-2013:3	-bb (Oxford Economics) -ca (Oxford Economics)
Latvia	2003:1-2013:3	-bb (Central Statistical Bureau of Latvia) -ca (Eurosat)
Lithuania	1995:1-2013:3	-bb (Bank of Lithuania) -ca (Lithuania Statistical Office)
Poland	1995:1-2013:3	-bb (Poland Central Statistical Office) -ca (OECD Economic Outlook)
Romania	1990:1-2013:3	-bb (Oxford Economics) -ca (Oxford Economics)
Serbia	2003:1-2010:1	-Budget balance (Ministry of Finance, Republic of Serbia) -Current account balance/GDP (Consulate General of the Republic of Serbia) -GDP (Statistical Office, Republic of Serbia)
Slovenia	2001:1-2013:3	-bb (Ministry of Finance, Republic of Slovenia) -ca (OECD Main Economic Indicators)

Note: *bb and ca represent the budget balance and current account balance as a percentage of GDP.*