Asymmetries in Twin Deficit Hypothesis: Evidence from CEE Countries

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Abstract

We apply nonlinear autoregressive distributed lag (NARDL) approach to investigate the relationship between budget deficit and current account deficit in Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia. Our results indicate that changes in current account deficit have a significant effect on the budget deficit in Poland and Romania in the long-run and Croatia, Poland, Romania and Slovakia in the short-run. On the other hand, changes in budget deficit significantly affect the current account deficit in Czech Republic, Hungary, and Slovakia in the long-run and in Czech Republic, Hungary, Slovakia, and Romania in the short-run. Therefore, we conclude that the twin deficit hypothesis is valid for Czech Republic, Hungary and Slovakia but not for the case of Poland, Croatia, Romania and Slovenia in the long-run. Finally, we also present evidence for the existence of asymmetric effects in this context.

Keywords: *twin deficit, asymmetry, CEE countries, Ricardian Equivalence*

JEL Classification: E60, F32, F40

Introduction

Twin deficit hypothesis has been one of the most empirically investigated topics in the economics since early 1990s. The observation of both high budget deficit and current account or trade deficit in the US during 1980s has brought the subject to economists' attention. There is no doubt that it is important to figure out whether there exists a systematic relationship between the government budget balance and external balance. If there is a relationship, then the important question is, how are these two variables related? Which of the variables is the driving or causing variable? Or is there a bi-directional relationship? Shedding

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light on this relationship has very important policy implications. For example, if an increase in the budget deficit has a significant effect on the current account deficit, then it should be a priority for policy makers to ensure fiscal discipline and get rid of high deficits to deal with current account problem. On the other hand, if there is no systematic relationship then these problems should be addressed separately.

High and persistent budget deficits would be clearly detrimental to economic activity by affecting economic variables such as interest rates, growth and investment. As for current account deficit, there is no consensus on the extent of its importance. Blanchard (2007) summarizes two opposite views on the issue. On the one hand, Lawson doctrine states that, under certain assumptions, if current account deficits reflect the private saving and investment decisions there is no reason for government to intervene. On the other hand, Blanchard (2007) explains prudential or IMF view suggesting that when current account deficits are too high, government should intervene to reduce them even if the deficits arise mainly from the private decisions. In essence, a current account deficit means that a country makes more investment than its domestic saving. Therefore, it is not necessarily a bad thing from the view point of economic theory. Rather, it would be just optimal to have current account deficits in an intertemporal setting. Since the link between the investment and growth is obvious, in order to have high growth rates, especially emerging or developing economies reasonably prefer to have more investment than their domestic saving could afford. Although Feldstein and Horioka (1980) show a close connection between the domestic saving and investment, i.e. Feldstein-Horioka puzzle, it would be not optimal to restrict the level of domestic investment to domestic saving. However, if a country has a very large current account deficit it would create some risks and make the country more fragile to external developments and sudden stops on capital inflows. Moreover, if a current account deficit stems from high government budget deficits, it would be more problematic and deserves more attention. Even Lawson's doctrine does not support that the current account deficit when driven by the budget deficit.

The relationship between the government budget deficit and current account deficit is important for Central and Eastern European (CEE) countries as well. The present study aims to contribute to the existing literature by examining the asymmetries in the relationship between the budget and current account deficits for Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia by means of nonlinear autoregressive distributed lag (NARDL) approach to co-integration. For example, do increases and decreases in the budget deficit have effects on the current account on the same magnitude? Ex ante, we think that

there would be asymmetries for some countries when we are dealing with twin deficit hypothesis. Our empirical findings strongly confirm the existence of asymmetries in this context. We review the literature in Section 1, explain the model and estimation method in Section 2, carry out unit root tests in Section 3, present and discuss the empirical results in Section 4, and conclude in last section.

1. Literature Overview

Keynesian theory posits a positive link between government budget deficit and current account, called conventional approach in the literature. According to the absorption or aggregate income-expenditure approach, an increase in the government budget deficit has an expansionary effect, leading to a rise in the total income and import demand. This suggests a deterioration in the current account balance. Similarly Mundell-Fleming model predicts that an increase in the government budget deficit raises the domestic interest rate and thereby attracting more capital flows. In a floating exchange rate system, capital flows cause the appreciation of domestic currency, making exports more expensive and imports cheaper. This mechanism eventually results in a worsening current account balance. Therefore, it can be argued that the budget deficit has a strong effect on the current account balance in this line of reasoning, implying a causal relationship running from the budget balance to the current account balance. Using time series techniques such as co-integration, error correction and/or causality analysis Dibooglu (1997) for US, Vamvoukas (1999) for Greece, Leachman and Francis (2002) for US, Akbostancı and Tunç (2002) for Turkey, Fidrmuc (2003) for some OECD and transition countries, Parikh and Rao (2006) for India, Grier and Ye (2009) for US, Perera and Liyanage (2012) for Sri Lanka, Trachanas and Katrakilidis (2013) for a group of European countries, Šuliková, Siničáková and Horváth (2014) for 3 baltic countries present evidence for twin deficit hypothesis. Some studies, such as Bagnai (2010) for Central and Eastern European countries, Chinn and Prasad (2003) for a large set of developing and industrial countries, Mohammadi (2004) for 20 industrial and 43 developing countries, Salvatore (2006) for G7 countries, Bartolini and Lahiri (2006) for a group of 26 countries and 18 OECD countries, Forte and Magazzino (2013) for European countries, obtain similar results by means of Ordinary Least Squares or panel data methods.

On the other hand, current account targeting, argued by Summers (1988), predicts an exactly opposite or reverse causality between the budget deficit and current account deficit, suggesting the current account deficit has an effect on the budget deficit. This argument is backed up by several empirical studies, based on

co-integration, error correction and/or causality analysis, including Anoruo and Ramchander (1998) for some Asian countries, Khalid and Guan (1999) for Indonesia and Pakistan, Hatemi-J and Shukur (2002) for US, Kim and Kim (2006) for Korea, Onafowora and Owoye (2006) for Nigeria, Marinheiro (2008) for Egypt, Kalou and Paleologou (2012) for Greece, Varol Iyidogan (2013) and Turan and Karakaş (2017) for Turkey. Moreover, some studies report a bi-directional relationship between the series under consideration, including Darrat (1988) for US, Islam (1998) for Brazil, Kouassi, Mougoue and Kymn (2004) for Thailand, Mukhtar, Zakaria and Ahmed (2007) for Pakistan, Pahlavani and Saleh (2009) for Philippines. In a different strand of the literature, Kim and Roubini (2008) highlight a totally distinct relationship between the government budget and current account deficit. They argue that there would be a negative relationship between the budget balance and current account, implying that an improvement in the budget balance accompanied with deterioration in the current account.

In a seminal study, Barro (1974) argues that it would not make a difference whether a government finances its expenditures via debt or taxation in an intertemporal setting under some assumptions. The use of budget deficits or debt only alters the time path of taxes but not total amount of liabilities. Given a government expenditure path, a cut in the tax rate does not change the output level, consumption, total savings or interest rates. Because rational and forward-looking economic agents predict that, a tax cut with no change in the government current and future expenditure means an equal tax increase on the liabilities in the future. Therefore, it is expected that economic agents increase their savings equally to offset the future tax increase. Contrary to Keynesian theory, Ricardian Equivalence hypothesis suggests that there is no systematic and robust relationship between the government budget and current account. Employing VAR, co-integration and/or causality methods Enders and Lee (1990) and Kim (1995) for US, Kuştepeli (2001) and Aksu and Başar (2009) for Turkey, Kaufmann, Scharler and Winckler (2002) for Austria, Kouassi, Mougoue and Kymn (2004) for some developed countries, Daly and Siddiki (2009) for 23 OECD member countries, Ganchev, Stavrova and Tsenkov (2012) and Tosun, Varol İyidoğan and Telatar (2014) for Central and Eastern European countries don't find a strong evidence for the existence of a positive relationship between the budget and current account deficits. Similarly, Aloryito, Senadza and Nketiah-Amponsah (2016) for 41 African countries fail to lend a robust evidence for twin deficit hypothesis by means of Generalized Methods of Moments.

Following a simple identity would be helpful to explain the possible relationship between the current account and budget balance:

$$CAD = BD - (I - S) \tag{1}$$

where

CAD – stands for current account deficit,
BD – for budget deficit (the government revenue minus spending),
I – for private investment,
S – for private saving.

This identity makes clear that a change in a government budget might or might not affect the current account balance. If the private saving and investment proportionally move with budget balance then current account would not respond to a change in the government budget. Mann (2002) argues that budget deficits turn to surplus but the current account deficit expands in the US by late 1990s. Mann (2002) also states that because of the high investment and attraction of foreign capital, the link between fiscal balance and current account balance observed during 1980s was broken during the 1990s in the US. Therefore, ex ante, we cannot conclude whether there exists a significant and robust relationship between the current account and budget balance. The only way to solve this dilemma is to use an empirical approach and carry out formal econometric analysis and tests.

2. Model and Estimation Method

In this study, we use NARDL approach to co-integration to analyse the relationship between budget deficit and current account deficit. In a linear equation, the effect of a negative change of an independent variable on the dependent variable is assessed as equal to a positive change. But, this logic of thought is not always valid in the dynamic economic models.

For example, a negative shock to current account deficit may affect budget deficit more in magnitude compared to a positive shock. Because of that, when dealing with co-integrating variables, it is more appropriate to use nonlinear models focusing on asymmetries. Recently, NARDL becomes one of the leading approaches to explain asymmetric effects of the variables in co-integration context. Thus, following Shin, Yu and Greenwood-Nimmo (2014), we decompose our variables to determine negative cumulative shocks to budget and current account deficits as given by equations 2 and 3:

$$BD_k^- = \sum_{k=1}^{t} \Delta BD_k^- = \sum_{k=1}^{t} \min(\Delta BD_k, 0) \tag{2}$$

$$CAD_k^- = \sum_{k=1}^{t} \Delta CAD_k^- = \sum_{k=1}^{t} \min(\Delta CAD_k, 0) \tag{3}$$

where *BD* and *CAD* represent budget deficit and current account deficit, respectively. On the other hand, we use equations 4 and 5 to obtain positive cumulative shocks to *BD* and *CAD*:

$$BD_k^+ = \sum_{k=1}^{t} \Delta BD_k^+ = \sum_{k=1}^{t} \max(\Delta BD_k, 0) \tag{4}$$

$$CAD_k^+ = \sum_{k=1}^{t} \Delta CAD_k^+ = \sum_{k=1}^{t} \max(\Delta CAD_k, 0) \tag{5}$$

After obtaining cumulative negative and positive shocks, we can utilize NARDL approach in the context of Autoregressive Distributed Lag (ARDL) methodology, since Shin, Yu and Greenwood-Nimmo (2014) application of NARDL approach follows a procedure that is very similar to Pesaran, Shin and Smith (2001) ARDL methodology. Shin, Yu and Greenwood-Nimmo (2014) include and use negative and positive cumulative shocks to series in ARDL context. Therefore, we can write NARDL equations for budget and current account deficits in equations 6 and 7 as:

$$\begin{aligned} \Delta BD_t = \alpha_0 + \sum_{j=1}^{p} \tau_{1j} \Delta BD_{t-j} + \sum_{j=0}^{r} \tau_{2j} \Delta CAD_{t-j}^- + \sum_{j=0}^{s} \tau_{3j} \Delta CAD_{t-j}^+ + \\ + \gamma_0 BD_{t-1} + \theta^- CAD_{t-1}^- + \theta^+ CAD_{t-1}^+ + \varepsilon_t \end{aligned} \tag{6}$$

$$\begin{aligned} \Delta CAD_t = \alpha_0 + \sum_{j=1}^{q} \tau_{1j} \Delta CAD_{t-j} + \sum_{j=0}^{v} \tau_{2j} \Delta BD_{t-j}^- + \sum_{j=0}^{y} \tau_{3j} \Delta BD_{t-j}^+ + \\ + \gamma_0 CAD_{t-1} + \theta^- BD_{t-1}^- + \theta^+ BD_{t-1}^+ + \varepsilon_t \end{aligned} \tag{7}$$

Note that we allow for a maximum of eight lags and use Akaike information criterion to determine optimal lag structure for equations 6 and 7 in the empirical analyses, since we employ quarterly dataset.

3. Data and Unit Root Tests

In this study, we obtain the budget deficit, current account deficit, and GDP data for Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia from Eurostat database. The dataset cover 1999:Q1 – 2016:Q4 for Czech Republic, Hungary, Romania, and Slovenia; 2002:Q1 – 2016:Q4 for Croatia; and 2004:Q1 – 2016:Q4 for Poland and Slovakia. Budget and current account deficits are calculated as a share of GDP and are seasonally adjusted.

Before using the series in NARDL approach, we check for stationary of each series since only series with a maximum of one unit root are allowed to be used in equations 6 and 7. Thus, we perform Augmented Dickey Fuller (ADF) test for each series in levels and first differences. The results are presented in Table 1.

Table 1

ADF Tests

Variable	*CAD*			*BD*		
	None	**Only I.**	**I.&T.**	**None**	**Only I.**	**I.&T.**
Croatia	–1.683*	–1.824	–3.857**	–0.944	–3.355**	–3.321*
Czech Republic	–1.279	–1.698	–6.343***	–1.723*	–2.996**	–5.666***
Hungary	–1.552	–1.248	–3.238*	–1.139	–1.733	–3.651**
Poland	–1.513	–1.317	–1.897	–1.116	–1.808	–1.882
Romania	–1.152	–1.796	–2.029	–1.189	–4.501***	–4.471***
Slovakia	–1.876	–2.744*	–5.489***	–0.699	–1.616	–1.652
Slovenia	–2.015**	–2.021	–3.214*	–1.887*	–7.168***	–7.45***
Variable	**Δ*CAD***			**Δ*BD***		
	None	**Only I.**	**I.&T.**	**None**	**Only I.**	**I.&T.**
Croatia	–11.022***	–11.008***	–10.912***	–10.574***	–10.477***	–10.446***
Czech Republic	–9.985***	–9.916***	–9.923***	–13.119***	–13.026***	–13.014***
Hungary	–10.05***	–10.129***	–10.061***	–4.453***	–4.379***	–4.481***
Poland	–7.435***	–7.52***	–7.443***	–8.919***	–8.897***	–8.803***
Romania	–9.171***	–9.105***	–9.081***	–8.243***	–8.179***	–8.116***
Slovakia	–12.257***	–12.22***	–12.119***	–6.024***	–5.962***	–5.996***
Slovenia	–13.239***	–13.338***	–9.023***	–10.503***	–10.424***	–10.357***

Notes: "I." and "T." are abbreviations for "Intercept" and "Trend", respectively. ***, **, and * indicate the significance at 1%, 5% and 10% levels, respectively.

Source: Authors.

Our findings show that both series for each country have at most one unit root since tests for the first differences of the series indicate no presence of a unit root. In other words, our series are integrated of order 1 or 0 and they are suitable for the NARDL procedure.

4. Empirical Results and Discussion

The results of the tests based on NARDL estimation of equation 6 are given in Table 2. First of all, it should be noted that we have to deal with stable equations to get accurate results for the tests since equations may show instability due to parameter changes in long time intervals. Thus, we use dummy variables to overcome the problem of structural changes whenever any equation fails to pass Cusum and Cusumq tests. Secondly, we perform LM test and ARCH test to check autocorrelation and heteroscedasticity for the equations because autocorrelation is especially a non-negligible risk that may lead us to incorrect conclusions.

F_{PSS} test is the test that we give utmost importance. It is named after Pesaran, Shin and Smith (2001) since we take critical values from their seminal work on ARDL. F_{PSS} test shows whether a co-integrating relationship between variables exists. It simply tests $H_0 : \gamma_0 = \theta^- = \theta^+ = 0$ against the alternative. According to F_{PSS} test results given in Table 2, we determine that there is a co-integrating relationship between budget and current account deficits in all countries except Hungary.

T a b l e 2

Tests for Dynamic Asymmetric Estimation Equations for Budget Deficit

Countries	Croatia	Czech R.	Hungary	Poland	Romania	Slovakia	Slovenia
F_{PSS}	13.079***	12.105***	4.087	18.056***	4.356*	6.375***	23.686***
L^-	0.147	–0.252	–	2.111**	1.842*	–0.848	–1.609
L^+	–0.693	–0.157	–	2.552**	2.233**	–1.276	–0.718
S^-	–1.971*	0.839	–	0.688	–1.691*	0.469	–1.047
S^+	–4.358***	–0.682	–	–3.793***	0.131	–2.813***	–1.141
W_{LR}	1.935*	–0.868	–	–0.017	–1.422	2.017*	–2.522**
W_{SR}	3.261***	0.97	–	2.118**	–1.094	1.771*	–0.694
R^2	0.516	0.372	0.629	0.922	0.495	0.757	0.961
adj. R^2	0.392	0.303	0.468	0.802	0.406	0.605	0.91
LM t.	[0.656]	[0.330]	[0.349]	[0.058]	[0.756]	[0.864]	[0.116]
ARCH t.	[0.093]	[0.445]	[0.291]	[0.97]	[0.949]	[0.505]	[0.577]
Cusum	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Cusumq	Stable	Stable	Stable	Stable	Stable	Stable	Stable

Notes: ***, **, and * indicate the significance at 1%, 5% and 10% levels, respectively; "adj.", "t.", and "Czech R." are abbreviations for "adjusted", "test", and "Czech Republic", respectively. Numbers in square brackets are p-values of the tests. F_{PSS} test statistic is utilized to check co-integrating relationship between variables. L^- and L^+ test statistics are used to determine the existence of long-term negative and positive effects, respectively. S^- and S^+ test statistics are used to determine the existence of short-run negative and positive effects, respectively. W_{LR} and W_{SR} test statistics are employed to check the existence of long-run and short-run asymmetry, respectively.

Source: Authors.

Thus, we exclude Hungary and apply further analyses on the remaining countries. Actually, we can state that there is a long-run relationship between budget and current account deficits for the countries passing F_{PSS} test. Further, L^- and L^+ represent the tests for long-term negative and positive effects on budget deficit. To get L^- and L^+ test statistics, we simply divide θ^- and θ^+ by γ_0 and define θ^-/γ_0 and θ^+/γ_0 as long-run negative and positive effects. Then, we check whether θ^-/γ_0 and θ^+/γ_0 are statistically significant or not. Our findings indicate the existence of negative and positive long-run effects for Poland and Romania. In other words, for these two countries, both negative and positive shocks to current account deficit have a significant impact. Actually, a positive change in current account deficit leads to a positive change in the budget deficit and a reduction in current account deficit leads to a decrease in the budget deficit. We should note that the coefficients on the positive and negative shocks are very similar to one other for these two countries. S^- and S^+ are tests for short-run negative and positive effects. S^- uses the null hypothesis $H_0 : \sum_{j=1}^{r} \tau_{2j} = 0$ against the alternative. Similarly, S^+ utilizes the null hypothesis $H_0 : \sum_{j=1}^{r} \tau_{3j} = 0$. Short-run negative effects are valid for Croatia and Romania. On the other hand, we

determine short-term positive effects for Croatia, Poland, and Slovakia. Interestingly, the signs of significant test results representing short-run dynamics are negative for all countries, suggesting twin divergence. Short-run deterioration of current account results in a decrease in budget deficit for Croatia and Romania. Conversely, short-run recovery of current account has a deteriorating effect on budget deficit for Croatia, Poland, and Slovakia. Therefore, it seems that long- and short-run effects follow different paths working against each other in some cases. For example, a recovery in current account deficit causes a decline in budget deficit in the long-run but, in the short-run, it has impairing impacts on the budget for the case of Poland.

W_{LR} is the test that utilizes the null hypothesis $\theta^{-}/\gamma_0 = \theta^{+}/\gamma_0$ to detect the existence of long-run asymmetry. According to the test results in Table 2, we find that there is a long-run asymmetry for the cases for Croatia, Slovakia, and Slovenia. This means that a positive and negative change in the current account deficit exert a significantly differing influence on the budget deficit. Also, W_{SR} represents test for short-run asymmetry utilizing $H_0 : \sum_{j=1}^{r} \tau_{2j} = \sum_{j=1}^{r} \tau_{3j}$ against the alternative. Results for W_{SR} show that short-run asymmetry exists for Croatia, Poland, and Slovakia. Also, our diagnostic tests are presented in Table 2 as Lagrange multiplier (LM), Autoregressive conditional heteroskedasticity (ARCH), Cumulative sum of recursive residuals (Cusum), and Cumulative sum of squares of recursive residuals (Cusumq) tests and do not indicate any problem in terms of autocorrelation, heteroscedasticity and stability.

We report parameter estimates of equation 6 for each country in Table A1 in the appendix and avoid any discussion to gain more space. The focus of this study is mainly on the statistics of L^{-}, L^{+}, S^{-}, S^{+}, W_{LR}, and W_{SR}. Note that we present only the findings for the countries that pass F_{PSS} test in the appendix, since detailed analyses are not used for the equations where co-integration between budget and current account deficits is not valid.

The results of tests based on equation 7 are given in Table 3. When current account deficit is used as the dependent variable, we get affirmative F_{PSS} test results for Czech Republic, Hungary, Romania, and Slovakia. There is a co-integrating relationship between budget deficit and current account deficit for these countries based on equation 7. L^{-} and L^{+} tests lend evidence for the existence of long-run negative and positive effects in the cases of Czech Republic, Hungary, and Slovakia. Negative long-run effects point out that a deterioration in budget results in the deterioration in current account. Also according to positive long-run test results, a long-term recovery on budget deficit has a positive impact on current

account. For example, a one unit positive shock to budget improves current account deficit approximately five units in Hungary. This impact is also economically significant supporting a strong relationship from budget deficit to current account deficit. We should also note that all statistically significant test results for the long-run have positive signs in all cases. Negative and positive short-term effects are determined by S^- and S^+ tests for Czech Republic, Hungary, Romania, and Slovakia. It can be stated that, unlike other countries, the coefficient on negative shocks is negative in the case of Slovakia in the short-run. For Slovakia, an increase in the budget deficit caused by a negative shock results in a recovery, in current account in the short-term. However, short-term negative dynamics for Czech Republic, Hungary, and Romania work conversely. Test results for positive shocks indicate negative statistics for Hungary and Romania and positive statistics for Czech Republic and Slovakia in the short-run. Positive shocks in Hungary and Romania caused by a decrease in budget deficit leads to the deterioration of current account, implying twin divergence. On the other hand, the short-run dynamics of a positive shock are different in the case of Czech Republic and Slovakia showing exactly the opposite pattern.

T a b l e 3

Tests for Dynamic Asymmetric Estimation Equations for Current Account Deficit

Countries	Croatia	Czech R.	Hungary	Poland	Romania	Slovakia	Slovenia
F_{PSS}	4.069	18.133***	8.258***	3.366	6.153***	8.406***	4.021
L^-	–	1.693*	2.052**	–	–0.921	2.723**	–
L^+	–	2.312**	5.179***	–	–1.55	4.728***	–
S^-	–	1.686*	3.086***	–	2.488**	–3.159***	–
S^+	–	2.281**	–4.262***	–	–2.12**	2.25**	–
W_{LR}	–	2.004**	–8.089***	–	2.037**	0.625	–
W_{SR}	–	–3.075***	4.782***	–	3.81***	–2.956***	–
R^2	0.48	0.47	0.506	0.719	0.603	0.816	0.287
adj. R^2	0.376	0.421	0.403	0.535	0.365	0.583	0.205
LM t.	[0.843]	[0.8]	[0.133]	[0.221]	[0.503]	[0.912]	[0.127]
ARCH t.	[0.968]	[0.941]	[0.958]	[0.804]	[0.282]	[0.52]	[0.935]
Cusum	Stable	Stable	Stable	Stable	Stable	Stable	Stable
Cusumq	Stable	Stable	Stable	Stable	Stable	Stable	Stable

Notes: ***, **, and * indicate the significance at 1%, 5% and 10% levels, respectively; +"adj.", "t.", and "Czech R." are abbreviations for "adjusted", "test", and "Czech Republic", respectively. Numbers in square brackets are p-values of the tests. F_{PSS} test statistic is utilized to check co-integrating relationship between variables. L^- and L^+ test statistics are used to determine the existence of long-term negative and positive effects, respectively. S^- and S^+ test statistics are used to determine the existence of short- run negative and positive effects, respectively. W_{LR} and W_{SR} test statistics are employed to check the existence of long-run and short-run asymmetry, respectively.

Source: Authors.

Further, W_{LR} test shows long-term asymmetric effects for Czech Republic, Hungary, and Romania. In other words, negative and positive shocks to budget deficit have long-term effects in significantly different magnitudes on current account deficit for these countries. Moreover, short-run asymmetry tested via

W_{SR} is valid for Czech Republic, Hungary, Romania, and Slovakia. Negative and positive short-run effects stemming from budget deficit influence current account deficit distinctly in these countries. Lastly, we reported diagnostic test results in Table 3 as LM, ARCH, Cusum and Cusumq tests. The tests show that there are no problems in terms of autocorrelation, heteroscedasticity, and stability in our estimations. Parameter estimates of equation 7 are shown for Czech Republic, Hungary, Romania, and Slovakia in Table A2 in the Appendix.

All in all, our results indicate that there is no evidence for twin deficit hypothesis in Croatia, Poland and Slovenia. As, when the current account is employed as dependent variable, we fail to find a co-integrating relationship for these three countries. However, we find positive coefficients in Czech Republic, Hungary and Slovakia in the long-run, supporting the twin deficit hypothesis. In the case of Poland and Romania, changes in current account influence the budget deficit in the long-run, suggesting the validity of reverse causality. We should also note that there is a bi-directional relationship between budget deficit and current account deficit in Romania and Slovenia in the short-run. Finally, we highlight the importance of short-run and long-run asymmetries existing in the dynamic asymmetric estimation equations for budget and current account deficits. We determine that long-run asymmetric effects are valid for Croatia, Slovakia, and Slovenia and short-run asymmetric effects exist for Croatia, Poland, and Slovakia in the dynamic asymmetric equation for budget deficit. In the case of the equation for current account deficit, we find that there are long-run asymmetric effects for Czech Republic, Hungary, and Romania and short-run asymmetric effects for Czech Republic, Hungary, Romania, and Slovakia.

Conclusion

We examine the relationship between budget deficit and current account deficit in Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia by means of NARDL approach. When we use the budget deficit as dependent variable, a long-run relationship exists between the current account deficit and budget deficit for Croatia, Czech Republic, Poland, Romania, Slovakia, and Slovenia. Our results indicate that both negative and positive shocks to current account deficit have significant positive coefficients in Poland and Romania in the long-run. In the short-run, it seems that a positive (negative) shock in current account significantly affects budget balance in Croatia (Croatia), Poland (Romania) and Slovakia. We should note that the sign of significant effects in the short--run is negative in all cases, implying twin divergence between two series under consideration. Our results indicate that there exists an asymmetric effect in Croatia,

Slovakia and Slovenia in the long-run and in Croatia, Poland and Slovakia in the short-run.

When current account deficit is employed as dependent variable, we find a co-integration for the cases of Czech Republic, Hungary, Romania, and Slovakia. It seems that the coefficients on both negative and positive changes in budget deficit are positive in Czech Republic, Hungary, and Slovakia in the long-run. On the other hand, in the short-run, we conclude that a change in the budget deficit has a significant impact on the current account deficit in all countries in which we find a co-integrating relation. Positive shocks in budget balance in Hungary and Romania lead to a deterioration of current account, while the opposite occurs in Slovakia, consistent with twin divergence argument in the short-run. As for asymmetric effects, we find that an asymmetry exists for Czech Republic, Hungary, and Romania in the long-run and all four countries in the short-run.

We conclude that the twin deficit hypothesis is not valid for Poland, Croatia, Romania and Slovenia, although there exists an evidence for reverse causality in the case of Poland and Romania. On the other hand, we find a supporting evidence for the twin deficit hypothesis in Czech Republic, Hungary and Slovakia in the long-run. We should highlight that fiscal policy would be effective in improving the current account deficit in these three countries in the long-run. On the other hand, some policies would affect long-term budget deficit through the current account balance in Poland and Romania. This implies that current account targeting would be a good policy option for these countries if they decide to improve the budgetary positions. It seems that making a distinction between short and long-run effects would be necessary in some cases. Because long-run and short-run effects differ from each other. Moreover, it is important to consider the relevant asymmetries since asymmetries require policy makers to distinguish between the effects of positive and negative shocks on budget or current account deficits. Finally, since the relationship between the current account and budget deficits is a complex one, there is no single recipe for all countries. Therefore, it would be more helpful to investigate and analyse this relationship in a time series or country specific context rather than panel settings for policy purposes and proposals.

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Appendix

Table A1

Dynamic Asymmetric Estimation Equations for Budget Deficit

Lag	0	1	2	3	4	5	6	7	8
Croatia#									
Constant	–0.406								
BD		–0.862***							
CAD^-		0.022							
CAD^+		–0.074							
ΔBD									
ΔCAD^-	–0.484*								
ΔCAD^+	–0.37*	–0.481**	–0.587***	–0.326*	–0.479**				
Czech Republic#									
Constant	–3.514***								
BD		–0.707***							
CAD^-		–0.053							
CAD^+		–0.031							
ΔBD									
ΔCAD^-	0.187								
ΔCAD^+	–0.174								
Poland									
Constant	–1.936**								
BD		–0.96***							
CAD^-		0.308**							
CAD^+		0.309***							
ΔBD		0.256	0.423**	0.396**	0.523***	0.653***	0.732***	0.646***	
ΔCAD^-	–0.017	–0.309	–0.239	–0.284	–0.288	1.071***	1.035**	0.51	
ΔCAD^+	–0.783***	–0.889***	–0.199	–0.989***	–0.615*	–0.593*	–1.261***	–0.873***	

Romania[#]									
Constant	–2.724*								
BD		–0.676***							
CAD^-		0.185*							
CAD^+		0.277*							
ΔBD		–0.131	–0.205	–0.254**					
ΔCAD^-	–0.554*								
ΔCAD^+	0.042								
Slovakia[#]									
Constant	1.022								
BD		–0.333***							
CAD^-		–0.095							
CAD^+		–0.128							
ΔBD		0.251*	0.543***						
ΔCAD^-	0.246***	0.075	0.013	0.173	–0.274***	–0.106	0.072		
ΔCAD^+	–0.453***	0.092	0.163	–0.284***					
Slovenia									
Constant	–10.163**								
BD		–1.941***							
CAD^-		–0.995							
CAD^+		–0.435							
ΔBD		0.033	–0.857***	–0.778***	–0.669***	–0.566***	–0.311**	–0.104	
ΔCAD^-	–0.725	–0.288	–0.695	–0.864	–0.606	–1.023	–1.403**	0.01	1.122**
ΔCAD^+	*0.85**	*0.541*	*–0.409*	*–0.857*	*–1.562****	*–0.263*	*0.486*	*–0.248*	*–1.352****

Notes: ***, **, and * indicate the significance at 1%, 5% and 10% levels, respectively. [#] shows that dummy variables for instability and structural breaks are used in the equation but not reported.

Source: Authors.

Table A2

Dynamic Asymmetric Estimation Equations for Current Account Deficit

Lag	0	1	2	3	4	5	6	7
Czech Republic[#]								
Constant	–2.625***							
CAD		–0.802***						
BD^-		0.206*						
BD^+		0.272**						
ΔCA								
ΔBD^-	0.274*							
ΔBD^+	–0.366							
Hungary								
Constant	–2.801***							
CAD		–0.515***						
BD^-		0.209*						
BD^+		0.432***						
ΔCA								
ΔBD^-	1.025***							
ΔBD^+	–0.482	–1.11***	–0.48	–1.163***	–0.15	–0.815***	–0.642**	
Romania[#]								
Constant	1.017							
CAD		–0.672***						
BD^-		–0.164						
BD^+		–0.248						
ΔCA		0.257*	0.074	0.164	–0.19			
ΔBD^-	0.035	0.12	0.022	0.317*	0.281	0.399**	0.384**	
ΔBD^+	–0.587***	–0.447*	–0.298	–0.323	0.011	–0.282	–0.2	

Slovakia[#]								
Constant	–10.484***							
CAD		–1.146***						
BD^-		4.169***						
BD^+		3.577***						
ΔCA		0.203	0.086	0.267				
ΔBD^-	–1.079*	–5.232***	–4.774***	–3.786**	–5.08***	–3.997**	–5.009***	–4.037**
ΔBD^+	3.256	2.611*	–0.825	–0.359	2.759	2.374	1.967	2.674*
Slovenia								
Constant	–0.979**							
CAD		–0.233**						
BD^-		–0.307***						
BD^+		–0.279***						
ΔCA		–0.244**	–0.23**					
ΔBD^-	0.004							
ΔBD^+	–0.274**							

Notes: ***, **, and * indicate the significance at 1%, 5% and 10% levels, respectively. # shows dummy variables for instability and structural breaks are used in the equation but not reported.

Source: Authors.