Determinants of current account in the EU: the relation between internal and external balances in the new members

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DETERMINANTS OF CURRENT ACCOUNT IN THE EU:

The relation between internal and external balances in the new members

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Abstract

This paper considers the major determinants of the current account in the new members of the EU. It examines the long-run and short-run impact of real exchange rate, investment, private and public savings on current account. The bounds testing autoregressive distributed lag (ARDL) approach to cointegration is used and the results indicate that twin deficit exists; in another words, government budget deficit shocks have led to deficit in current accounts in Czech Republic, Latvia, Lithuania, Slovenia and Slovakia for the considered period. At the same time, empirical evidence was found that private savings, investment and real exchange rate are key variables as well, causing changes in the current account in the long-run as well as in the short-run. Finally, stability tests were applied to the model indicating no evidence of any structural instability in the model of these countries.

JEL codes: F31, F32, F40

Key Words: Twin deficit, current account balance, budget deficit, EU.

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1. Introduction

The determinants and dynamics of the current account constitute an important topic in open economy macroeconomics. Alternative theories try to predict the sign and the magnitude of the current account determinants. Different approaches to testing the empirical implications of these theories continue to attract considerable interest.

Among the analysis of the current account, the relation between external and internal balances, and deficits in specific, deserve significant attention in the literature. Deficits often are cited as either a cause or a symptom of economic weaknesses. However, 'deficits are neither causes nor symptoms of weaknesses, but are among the many macroeconomic quantities that are determined jointly by the decisions and interactions of households, firms and governments' in both national and international markets (Pakko, 1999, 13).

Questions regarding the determinants of fiscal balance and the current account attracted attention in the early 1980s and later in the 2000s, mainly because of the high current account of the US, for example, in early studies by Mc Kinnan (1980), Laney (1984), Bernheim (1988), Miller and Russek (1989), Enders and Lee (1990), Dewald and Ulan (1990), Rosenweig and Tallman (1993). Recent studies such as those by Mann (2002), Obstfeld and Rogoff (2004, 2005), Erceg et al. (2005), Bordo (2006), Coughlin et al. (2006), Salvatore (2006), Corsetti and Muller (2006) and Kim and Roubini (2008) examined whether the budget deficit causes trade deficit. There are some studies supporting twin deficits such as those by Bernheim (1988), Roubini (1988), Miller and Russel (1989), Normandin (1999), Salvatore (2006), Chinn and Prasad (2003). There are also studies in favour of twin divergence such as those by Evans (1986), Enders and Lee (1990), Dewald and Ulan (1990), Erceg et al. (2005), Corsetti and Muller (2006) and Kim and Roubini (2008). Additionally, some studies provide mixed evidence such as those by Darret (1988), Abell (1990), Rosenweig and Tallman (1993), Kao and Coskey (1999) and Chin and Prasad (2003).

This study investigates the major determinants of the current account in the new members of the EU for the short run and long run. Furthermore, it studies whether there is a cointegration relationship between the current account and major variables such as the real exchange rate (RER), investment decisions, private savings and the fiscal balance in new EU members. This also allows for the consideration of the effects of the government spending shock on the external sector. Understanding the factors behind the current account fluctuations could have important policy implications yet the recent episodes of macroeconomic turbulence in many emerging markets in the EU support the increasing concerns and deserved attention on this topic.

This study is different from the early studies in that the focus is primarily on the analysis of the short-term and long-term fluctuations in current account in the new EU members and the establishing relationship between current account and its determinants by using recent econometric techniques, rather than the simple relation of the current account with the budget balance. The analysis is structured as follows: Section 2 starts with an overview of the composition of current account and the recent developments. Section 3 explains the theory and the model used in this analysis. Section 4 shows the methodology and section 5 discusses the empirical results of the analysis. Finally, section 6 gives concluding remarks.

2. Theory and Model

The framework of the national accounts defines a clear relationship between external and internal balances within an economy.

$$Y_t = C_t + I_t + G_t + (X_t - M_t) \qquad (1)$$

By rearranging the variables,

$$(X_t - M_t) = Y_t - C_t - G_t - I_t = S_t - I_t \quad (2)$$

where $C_t - G_t - I_t$ is equal to the sum of private and public consumption. This means that the external account has to equal the difference of national savings and investment. This relation implies that current account is related directly to saving and investment in the economy. Therefore, the polices supporting investment have a negative impact on the current account, while policy measures reducing private or public consumption have a positive impact on the current account, because they increase national saving.

Further insights into policy implications are given by dividing the national saving into public and private saving.

$$(X_t - M_t) = (Y_t - T_t - C_t) + (T_t - G_t) - I_t = S_t^p + S_t^g - I_t \quad (3)$$

After inducing the real variables to the model, it becomes as follows:

$$\frac{TB_t}{P_t} = (Y_t - \frac{NT_t}{P_t} - \frac{P_{Ct}}{P_t} C_t) + (\frac{NT_t}{P_t} - G_t) - \frac{P_{It}}{P_t} I_t \quad (4)$$

where TB_t is the nominal trade balance, P_t is the GDP deflator, NT_t is the taxes net of transfers, P_{Ct} is the price of final consumption goods that are purchased and P_{It} is the price of final investment goods. So, the real trade balance is the sum of real private and public saving minus real investment. If the private savings are roughly equal to the investment then the external account and public budget are directly interrelated, or twinned. According to the Mundell-Flemming approach, the external account and fiscal balance have to move in the same direction. In other words, an increase in budget deficit causes an increase in interest rates that causes an increase in capital inflows and appreciation of the domestic currency thereby causing a current account deficit. Fiscal deficit causes current account deficit, or twin deficits.

Alternatively, higher real interest rates induce an appreciation of the real exchange rate; the relative price of imported goods falls, while the relative price of exported goods rises in the foreign market. This may increase the terms of trade, however, boosting real import demand and reducing export demand. The increase in real import demand is partly offset by a decline in private consumption and investment spending. Furthermore, a rise in budget deficit leads to a fall in national saving unless there is an equal offsetting rise in private savings. Therefore, an increase in budget deficit has to reduce either private investment or net export. Twin deficit is a short hand way for saying that almost all of that adjustment was in net exports. The division of the response to lower saving between investment and trade deficit depends on certain key parameters and on changes in external environment. The factors that the magnitude of the responses of real trade demand depends on are (Erceg et al., 2005, 382):

- The magnitude of the real exchange rate appreciation and the sensitivity of the exchange rate to the level of interest rate,
- The price elasticities of export and import demand, and
- Factors that determine the response of private consumption and investment spending, i.e. the sensitivity of the investment to interest rate.

Furthermore, ceteris paribus, decline in investment is a smaller fraction of the fall in national saving when investment has low sensitivity to interest rate, or/and the exchange rate is sensitive to the level of interest rate or/and trade is sensitive to exchange rate. This mixture of changes in investment and net export need not have been the response to a decline in national saving, let alone to an increase in the budget deficit. More fundamentally, the response to a budget deficit or, more generally, to a fall in savings is not likely to be the same in the long run as in the short run. Changes in domestic saving are balanced generally in the short run by changes in international flows, but changes in domestic savings that persist, lead to parallel change in domestic investment. Feldstein and Horioka (1980) find a substantial degree of correlation between the country's domestic saving and domestic investment rates over the medium term. This shows that capital is not very mobile across national borders.

The aim of this study is to assess the major determinants of the current account and to study whether there is a twin deficit in the new members of the EU by using recent econometric techniques. First, current account will be used and for the exogenous variables real exchange rate to measure whether there is price elasticity of trade demand. An increase in RER is associated with the appreciation of the currency, where it reduces the competitiveness of the country and reduces current account. Any increase in interest rate increases the amount of saving and reduces investment, so interest rate and current account are positively related. Changes in interest rates indirectly affect the current account. Any increase in interest rate would result in capital inflow and might be used in financing exports. Any increase in interest rates would be expected to reduce the amount of investment and increase the amount of saving, so we expect a positive relation between interest rate and current account. Under these circumstances, the model becomes:

$$\log CA_t = a_0 + a_1 \log RER_t + a_2 \log I_t + a_3 \log S_t^p + a_4 \log S_t^g + \varepsilon_t \qquad (5)$$

where *CA* is the current account, *RER* is the real exchange rate, *I* is the private investments, S^p is the private savings and S^g is the government saving and ε is the error term.

3. Methodology

The test for cointegration in a single-equation framework is based on the coefficient of the lagged dependent variable in an autoregressive distributed lag (ARDL) model advocated by Hendry and Richard (1982). A relatively recent econometric technique developed by Pesaran et al. (1996, 2001) is used to estimate the long-run relationship among variables. The bounds testing or autoregressive distributed lag (ARDL) approach tests the cointegration relationship without requiring the same order of integration of all variables. Later the model was extended by including the error correction term (Phillips and Loretan, 1991; Saikkonen, 1991; Hendry, 1995).

The focus of the analysis is to study the long-run relationship and dynamic interactions among the variables of current account. However, to incorporate the short-run dynamics, the model has been estimated by using the ARDL approach to cointegration. Furthermore, the reasons for ARDL are as follows:

- It is simple, allowing cointegration relationship once the lag order of the model is identified.
- It does not require a unit root test, therefore it is applicable irrespective of whether the regressors in the model are purely stationary $I(0)$, purely non-stationary $I(1)$ or mutually cointegrated.
- The test is relatively more efficient in small samples or finite sample data sizes. The procedure will crush, however, in the presence of $I(2)$ series (integrated of order 2).

The ARDL approach involves two steps for estimating the long-run relationship (Pesaran et al., 2001). The first step is to examine the existence of long-run relationship among all variables in an equation and the second step is to estimate the long-run and short-run coefficients of the same equation. We run the second step only if we find a cointegration relationship in the first step. This step determines the appropriate lag lengths for the independent variables. Finally, the study uses a more general formula of error correction model (ECM). In error-correction models, the long run multipliers and short run dynamic coefficients improve the model as follows:

$$\Delta \log CA_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta \log CA_{t-i} + \sum_{i=0}^{p} \alpha_2 \Delta \log RER_{t-i} + \sum_{i=0}^{p} \alpha_3 \Delta \log I_{t-i} + \sum_{i=0}^{p} \alpha_4 \Delta \log S^{p}_{t-1} + \sum_{i=0}^{p} \alpha_5 \Delta \log S^{g}{}_{t-i}$$

$$+ \beta_1 \log CA_{t-1} + \beta_2 \log RER_{t-1} + \beta_3 \log I_{t-1} + \beta_4 \log S^{p}_{t-1} + \beta_5 \log S^{g}_{t-1} + \delta_1 EC_{t-1} + \varepsilon_t \quad (6)$$

The ARDL approach is used to establish whether the dependent and independent variables in each model are cointegrated. The null of no cointegration, i.e. $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ is tested against the alternative of $H_1 : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. So, we are looking at the ARDL bounds testing approach to estimate these equations by ordinary least square (OLS) test in order to test for the existence of coefficients of the lagged variables.

We have to conduct a Walt-type (F-test) coefficient restriction test, which entails testing the above null hypotheses H_0 and $H_0^{'}$. Pesaran et al. (2001) computed two sets of asymptotic critical values for testing cointegration. The first set assumes variables to be I(0), the lower bound critical value (LCB) and the other I(1), upper bound critical value (UCB). If the F-statistic is above the UCB, the null hypothesis of no cointegration can be rejected irrespective of the orders of integration for the time series. Conversely, if the test falls below the LCB the null hypothesis cannot be rejected. Finally, if the statistic falls between these two sets of critical values, the result is inconclusive.

Since the results of the F-test are sensitive to lag lengths, we applied various lag lengths in the model. However, as Pesaran and Pesaran (1997, 305) argue that variables in regression that are ‘in first differences are of no direct interest’ to the bounds cointegration test. Thus, a result that supports cointegration at least any one lag structure provides evidence for the existence of long-run relationship. Alternatively, Kremers et al. (1992) and Banerjee et al. (1998) have demonstrated that in an ECM, significant lagged error-correction term is a relatively more efficient way of establishing cointegration. So, the error correction term can be used when the F-test is inconclusive. The model in equation 6 shows that α coefficients represent the short-run dynamics and β coefficients represents the long-run dynamics of the current account that will be discussed later. Following Nielsen (2004), using any dummy in the autoregressive model is avoided. According to Nielsen (2004), the best results are obtained in cases where the cointegration rank initially is determined in a model with no dummies.

Finally, to ensure that our model passes the stability test, we incorporate the CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMSQ (Cumulative Sum of Square of Recursive Residuals) stability tests proposed by Brown et al. (1975) into the cointegration procedure. The existence of a cointegration relationship does not imply yet the stability of the estimated model, therefore the appropriate stability tests need to be conducted additionally after cointegration is established. These tests are based on the recursive residuals and squared recursive residuals, respectively, of the evaluated model and are plotted against break points. If the plots of CUSUM or CUSUMSQ statistics stay within the critical bounds of the 5% significance level, the null hypothesis of the coefficients' stability in the error correction model can not be rejected. In this paper, the CUSUM and CUSUMSQ stability tests conducted in order to investigate the stability of the estimated model due to the high importance of the information on the stability of the exchange rate model for policy makers in dealing with exchange rate policy designing.

4. Empirical Results

The analysis starts with investigating whether there is a cointegrating relationship between current account and its variables, which are real exchange rate, investment, private savings and public savings. We report the estimation results of the bounds tests for cointegration in the new EU members, which are Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovenia and Slovakia. As Bahmani-Oskooee and Brooks (1999) showed in their study, the results of F-test are sensitive to lag tests. Therefore, F-test used different lag lengths for the bounds testing approach for cointegration. F-tests were applied for each first differenced variable by changing the lag lengths from 0 to 4. The order of the lag distribution was selected by using the Akaike Information Criterion (AIC) or Schwartz Bayesian Criterion (SBC). Equation (6) was estimated using the ARDL approach to determine whether the dependent and independent variables in each model are cointegrated. Table 1 reports the results of these estimations.

The results of the bounds tests for cointegration show that the calculated F-statistics for Czech Republic, Lithuania, Slovenia and Slovakia are higher than the upper-bound critical value 3.898 at the 1% significance level. Thus the null hypothesis of no cointegration can not be accepted in the cases of these countries with a lag length of 1. In the cases of Bulgaria, Estonia and Latvia, the F-statistics fall between the lower and upper critical values at 90%. Therefore, we can not reject the null hypothesis, but we can not accept it as well. The result in the cases of Bulgaria, Estonia and Latvia is inconclusive at the order of 1 distributed lag. Therefore, following Kremers et al (1992) the significant lagged error-correction term will be the efficient way of establishing cointegration in these countries. However, in the case of Poland, the null hypothesis of no cointegration can not be rejected, as F-statistics are lower then lower-bound critical value. Therefore, as there are no cointegration relationships between selected variables in the case of Poland, we can not apply the ARDL approach to this country case. Based on the results represented in Table 1, we can conclude that there is strong support for long-run relationships in the model of Czech Republic, Lithuania, Slovenia and Slovakia, and inconclusive results for the cases of Bulgaria, Estonia and Latvia, which will be verified once more by the error correction term from the ARDL estimations of the equation (6).

Following the establishment of the existence of cointegration, equation (6) was estimated using individual ARDL specifications for every country, except Poland, selected by

SBC and AIC. The results for long-run coefficients are presented in Table 2 where the dependent variable is the current account balance, CA. It can be seen from the table that most of the estimated coefficients of all variables have the correct sign with a high significance level for most of the cases. The coefficients of private savings, S_P, and investments, I, indicate that in all selected countries higher private savings improve, while higher investments worsen current account balance, as predicted by the theory. However, according to estimations it seems that private savings in the case of Slovakia and investments in the case of Estonia do not affect their current account balances in the long-run.

The long-run coefficients of the real exchange rate in the cases of the Czech Republic, Lithuania, Slovenia and Slovakia provided evidence in support of the theory, indicating that the devaluation of the domestic currency improves current account balance. However, in the case of Bulgaria, the long-run coefficient of the real exchange rate appeared with positive sign and was highly elastic. The devaluation of the domestic currency in the case of Bulgaria does not improve, but increases the current account deficit. This can be explained by the great dependence of Bulgaria on import commodities, which are mainly fuels, minerals, raw materials and machinery, 60 percent of which are imported from the European Union. In the cases of Estonia and Latvia, evidence of the effect of the real exchange rate on the current account was not found.

The long-run coefficients of public savings have positive sign and are highly significant in the cases of the Czech Republic, Latvia, Lithuania, Slovenia and Slovakia. It indicates that current account deficits are associated directly with budget deficits in the long run, which provides evidence of twin deficit in these countries. In the models of Bulgaria and Estonia, the current account balance seems not to be affected by changes in the budget balance.

In Table 3, the short-run diagnostic statistics from the estimation of equation (6) are reported. These are tests for serial correlation, functional form, normality and heterosckedasticity. The results show that the short-run model in most of the cases passes through all diagnostic tests.

The results of the short-run coefficient estimates associated with the long-run relationships obtained from the ECM version of the ARDL model are presented in Table 4. The ECM coefficient is supposed to be significant with negative sign indicating the speed of the adjustment of variables to the long-run equilibrium. In the cases of all 7 estimated countries the error correction coefficient EC(-1) is highly significant at the 1% significance level with negative sign. These results ensure once more that stable long-run relationships among variables in the model of current account balances exist in all considered countries, Kremers et al. (1992), Bannerjee et al. (1998). Therefore, the negative and significant error correction term verified the existence of long-run cointegration relationships in countries with inconclusive results (Table 1), which are Bulgaria, Estonia and Latvia. The magnitude of the error correction coefficient is between -0.45 and -1.00, depending on the estimated country. Therefore, it implies that disequilibria in the current account balance model is corrected by approximately 45-100 percent every quarter (respectively to country). This means that steady state equilibrium in the current account balances can be reached depending on the time period between one and two and half quarter, respective to country.

From Table 4 it can be followed that all selected variable have a significant impact on the current account balances. Signs of the short-run coefficients correspond to the long-run coefficients' signs from Table 2. It can be seen from Table 4 that in the short-run private savings in the considered countries improve the current account balances, while investments worsen it. The devaluation of domestic currency in the short-run improves the current account balances even in the case of Bulgaria, where the devaluation of the domestic currency appeared to lead to the current account deficit in the long-run, but not in the short-run, can be seen in Table 4. In the cases of all of the countries, the budget balance has a strong positive impact on the current account balance. The empirical results of this study support the conventional view that a rising budget deficit leads to the escalation of trade deficits. The coefficient of determination R^2 varies from 0.86 to 0.99 indicating that a minimum 86 percent of changes in the current account balances of considered countries are explained by the selected model.

Finally, to ensure that our models pass the stability test, we apply the CUSUM and CUSUMSQ tests proposed by Brown et al. (1975) to the residuals of the error-correction model (6). The graphical results of these tests for Estonia and Slovakia cases are illustrated in Figure 1. The graphical results for other countries are not presented here due to space limitations. The results of the stability tests are summarized in Table 4 in columns CUS and CUS2. In most cases, the plots of the CUSUM and CUSUMSQ statistics stay within the critical bounds indicating the stability of estimated coefficients. Thus, the model of the current account balance remains stable with no regard to the specific lag selection criterion in most cases. However, in the cases of Slovenia and Slovakia it appears that stability is not confirmed by both the plots of CUSUM and CUSUMSQ statistics, which leaves us with inconclusive results for these countries.

5. Conclusion and further study

This study tries to ascertain the major causes of current account deficit from the simple Mundel-Flemming approach for eight new members of the EU in the short-run and long-run. Furthermore, it investigates the cointegration relationships between the current account and major variables such as the real exchange rate, investment decisions, private savings and fiscal balance in the new EU members. According to the Mundell-Flemming approach, budget deficit leads to an increase in the domestic interest rate. This in turn is followed by the appreciation of domestic currency due to the increase in capital inflow. Appreciated domestic currency reduces the price competitiveness of exports creating by this a deficit of the current account. In another words, a budget deficit leads to the twin deficit.

In this study, we found strong support for the existence of cointegration relationships between model's variables in all countries except Poland. Therefore, Poland was not included in further estimations. The estimations of the ECM model (6) using the ARDL approach provided strong evidence for the existence of the twin deficit in the Czech Republic, Latvia, Lithuania, Slovenia and Slovakia. This study verified that in these countries a government budget deficit shock worsened the current account. At the same time, private savings, investment and real exchange rate appeared to be key variables as well causing changes in the trade deficit in the long-run as well as in the short-run. Finally, CUSUM and CUSUMSQ tests confirmed the stability of coefficients in the model of current account balances in Bulgaria, Czech Republic, Estonia, Latvia and Lithuania, indicating no evidence of any structural instability in the model of these countries. The diagnostic statistics indicated that more than 86% of changes in the current account balances of the considered countries are explained by the selected model.

For the further analysis it would be useful to update the data series to cover the period of financial crisis. In addition, we might try to find answers to questions such as "What are we doing with the resources that we are borrowing from the rest of the world? Are they being used to finance consumption or to invest in assets that will pay off in the future flows of goods and services?"

6. APPENDIX 1. Data

This study includes quarterly data for the period 1995Q1-2008Q3 for 8 new EU members, which are Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovenia and Slovakia. Definitions for the selected data are as follows:

CA Current Account is represented by the trade balance.

RER Real Exchange Rates are calculated from the CPI data, where increases denote appreciation of domestic currency.

I Gross Investments are calculated from the gross domestic product expenditure approach.

S^p Private Savings are calculated from the gross domestic product expenditure approach, which is equal to GDP minus private consumption.

S^g Public Savings are represented as the Net Landing/Borrowing of the consolidated budget balances.

All data, except real exchange rate are taken as share of the GDP and obtained from the official site of the EU, the Eurostat.

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Table 1: F-statistics for testing cointegration relationship between variables CA, S_P, S_G, RER and I.

Country	Lags	F-statistic	Probability
Bulgaria	1	F(5, 26) = 2.92	0.032*
Czech Republic	1	F(5, 38) = 5.06	0.001*
Estonia	2	F(5, 32) = 2.20	0.078
Latvia	1	F(5, 38) = 2.98	0.023*
Lithuania	1	F(5, 38) = 6.55	0.000*
Poland	1	F(5, 22) = 1.73	0.170
Slovenia	1	F(5, 38) = 5.21	0.001*
Slovakia	1	F(5, 38) = 4.35	0.003*

Notes: Asymptotic critical value bounds are obtained from Table "Critical values for the bounds test" case III: unrestricted intercept and no trend for k=4 from Narayan (2005).

Table 2: Long Run Coefficients using the ARDL approach

Country	C	RER	I	S_P	S_G	ARDL model
Bulgaria	-295.09*** (2.87)	136.79** (2.59)	-1.11*** (9.67)	1.37*** (8.79)	-0.19 (1.55)	ARDL(2,0,2,1,0)
Czech Republic	9.07 (0.69)	-0.39*** (3.38)	-0.61*** (7.44)	0.46** (2.74)	0.51*** (5.49)	ARDL(2,2,0,0,0)
Estonia	-147.58*** (3.07)	5.69 (2.01)	-0.37 (1.16)	1.49*** (3.52)	0.38 (1.29)	ARDL(2,0,2,0,2)
Latvia	-9.68* (1.75)	2.36 (0.49)	-0.44*** (4.51)	0.34* (2.32)	0.39*** (3.61)	ARDL(1,0,1,1,0)
Lithuania	-0.07 (0.02)	-0.98*** (3.32)	-0.37*** (4.79)	0.23* (2.05)	0.52*** (4.84)	ARDL(0,2,2,0,2)
Slovenia	-32.88*** (10.11)	-0.02*** (3.09)	-0.69*** (6.42)	1.23*** (8.81)	0.23** (2.12)	ARDL(2,0,0,0,2)
Slovakia	29.67*** (2.87)	-0.29*** (2.86)	-0.63*** (4.35)	-0.03 (0.13)	0.49*** (3.44)	ARDL(1,1,1,0,0)

Notes: Figures in parentheses represent absolute values of t-statistic.

***, **, * denote 1%, 5% and 10% significance level.

Table 3: The Short-run diagnostic statistics

Country	LM SC	RESET	Normality	HS
Bulgaria	χ2 (4)=2.722[0.605]	χ2 (1)=1.178[0.278]	χ2 (2)=0.347[0.841]	χ2 (1)=0.512[0.474]
Czech Republic	χ2 (4)=3.133[0.536]	χ2 (1)=4.929[0.026]	χ2 (2)=3.943[0.139]	χ2 (1)=0.188[0.665]
Estonia	χ2 (4)=7.310[0.120]	χ2 (1)=1.063[0.303]	χ2 (2)=0.448[0.799]	χ2 (1)=0.032[0.858]
Latvia	χ2 (1)=0.485[0.486]	χ2 (1)=8.187[0.004]	χ2 (2)=1.362[0.506]	χ2 (1)=2.418[0.120]
Lithuania	χ2 (2)=0.913[0.634]	χ2 (1)=0.699[0.403]	χ2 (2)=15.529[0.000]	χ2 (1)=0.112[0.738]
Slovenia	χ2 (4)=2.905[0.574]	χ2 (1)=0.667[0.414]	χ2 (2)=2.292[0.318]	χ2 (1)=1.357[0.244]
Slovakia	χ2 (4)=8.203[0.084]	χ2 (1)=0.216[0.642]	χ2 (2)=18.792[0.000]	χ2 (1)=0.198[0.656]

Notes: Figures in parentheses represent probabilities. LM is Lagrange multiplier test of residual serial correlation for lag 4 with the null of no serial correlation; RESET is Ramsey's RESET test using the square of the fitted values; Normality is Jarque-Bera statistic used for testing normality; and HS is White's test which is used with the null hypothesis of no heterosckedasticity. All statistics distributed as X^2 with degrees of freedom in parentheses.

Table 4: Error correction Representations of ARDL model

The independent variable is **ΔCA_i**

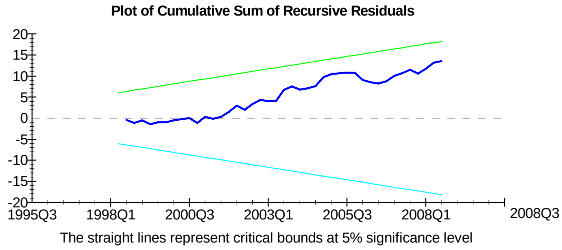
Country	**ΔCA1**	**ΔRER**	**ΔI**	**ΔI1**	**ΔS_P**	**ΔS_P1**	**ΔS_G**	**ΔS_G1**	**C**	**EC(-1)**	$\bar{R}^2$	**F**	**DW**	**RSS**	**CUS**	**CUS^2**
Bulgaria	0.27*** (3.93)	-160.6** (2.04)	-0.92*** (9.23)		1.13*** (10.15)		0.18** (2.20)	0.21*** (2.74)	-243.59*** (2.86)	-0.83*** (9.19)	0.99	537.31	1.65	39.59	S	S
Czech Republic	-0.18*** (2.90)	-0.28*** (3.67)	-0.44*** (5.67)		0.56*** (5.61)	0.78*** (7.23)	0.37*** (7.17)		6.47 (0.72)	-0.71*** (9.34)	0.89	64.75	1.79	28.25	S	S
Estonia	-0.50*** (3.91)	2.57 (1.94)	-0.32*** (3.78)	-0.19*** (2.77)	0.67*** (4.89)		0.49*** (5.88)	0.28** (2.29)	-66.77*** (2.99)	-0.45*** (3.74)	0.91	65.27	2.23	80.71	S	S
Latvia		-25.56 (1.81)	-0.34*** (4.86)		0.26** (2.34)		0.57*** (7.46)		-7.55* (1.72)	-0.78*** (7.42)	0.93	134.00	2.08	70.68	S	S
Lithuania		-0.97*** (3.32)	-0.21*** (2.95)	-0.17** (2.36)	0.22** (0.39)	0.32*** (3.23)	0.56*** (6.69)	-0.29*** (3.72)	-0.07 (0.02)	-1.00	0.96	155.68	2.19	41.78	S	S
Slovenia	-0.20*** (5.11)	-0.17*** (3.54)	-0.82*** (10.11)	-0.29*** (6.89)	0.89*** (10.44)		0.17** (2.19)		-23.69*** (13.91)	-0.73*** (12.48)	0.98	420.43	1.84	6.98	S	U
Slovakia		-0.19** (2.58)	-0.39*** (3.59)		0.41*** (2.87)		0.65*** (9.09)		18.49*** (2.81)	-0.62*** (5.45)	0.86	66.07	2.36	116.94	S	U

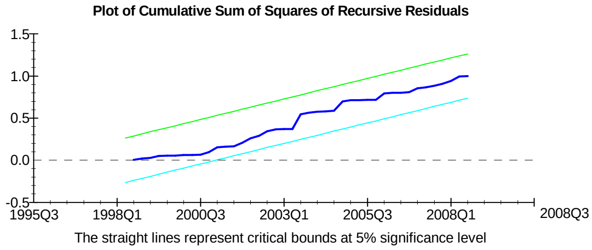
Note: ΔCA1 = CA(-1) – CA(-2); $\Delta S_P = S_P - S_P(-1)$; $\Delta S_P1 = S_P(-1) - S_P(-2)$; $\Delta S_G = S_G - S_G(-1)$; $\Delta S_G1 = S_G(-1) - S_G(-2)$; ΔRER = RER – RER(-1); ΔI = I – I(-1); ΔI1 = I(-1) – I(-2)

Figures in parentheses represent absolute values of t-statistic. ***, ** denote 1% and 5% significance level. F column present F-statistics; DW – Durbin Watson statistics; RSS – Residual Sum of Squares, CUS – CUSUM stability test, CUS^2 – CUSUMSQ stability test.

Figure 1: Plots of CUSUM and CUSUMSQ Statistics for Coefficient Stability

a. Estonia





b. Slovakia