

Branko Urošević

National Bank of Serbia;
Faculty of Economics,
University of Belgrade,
Serbia
✉ branko.urosevic@nbs.rs

Milan Nedeljković

National Bank of Serbia;
Faculty of Economics, Finance and
Administration,
Singidunum University,
Belgrade,
Serbia
✉ milan.nedeljkovic@nbs.rs

Emir Zildžović

National Bank of Serbia;
Serbia
✉ emir.zildzovic@nbs.rs

Paper by invitation

The authors thank Sanja Borković for excellent research assistance, and Bojan Marković, Milan Sojić and other participants at the National Bank of Serbia research seminar for useful comments and suggestions. Branko Urošević gratefully acknowledges support of the Serbian Ministry for Education and Science, Grant No OH 179005.

Jackknife Model Averaging of the Current Account Determinants

Summary: This paper investigates the short to medium-term empirical relationships between the current account balances and a broad set of macroeconomic determinants in Serbia and selected CEE countries. Using novel model averaging techniques we focus the analysis to individual country's data only. The results suggest that the model tracks the current account movements over the past decade quite well and captures its relative volatility. Signs and magnitudes of different coefficients indicate significant heterogeneity among countries providing empirical support for the country-level analysis.

Key words: Current account, Model averaging, Transition countries.

JEL: F32.

1. Introduction and Short Literature Review

The importance of the current account (CA) balance as one of the leading indicators of the future behavior of an open economy has been emphasized both in theoretical and economic policy literature. Large CA deficits may lead to serious crises when they are caused by persistent internal imbalances or coincide with large exogenous shocks (see for example Steven B. Kamin, John W. Schindler, and Shawna L. Samuel 2007). More recently, Òscar Jordà, Mortz Schularick, and Alen M. Taylor (2011) also find that external imbalances historically played a role in predicting financial crises. Understanding the determinants of CA imbalances therefore has important policy implications. A deficit caused by a reduction in savings is likely to be more dangerous than the one fueled by a surge in investments if the latter contributes to future growth and a country's improved ability to repay the accumulated debt.

There is a large literature, both theoretical and empirical, that analyses the dynamics of the CA balance. The intertemporal approach to the CA that appeared in 1980s (Jeffrey D. Sachs 1981) and was further elaborated in the new open economy macroeconomics literature (Maurice Obstfeld and Kenneth S. Rogoff 1996) provides a workhorse model for the analysis. The model treats CA as an outcome of

consumption and investment decisions made over a long-term horizon under forward looking expectations. More concretely, with an infinitively lived representative agent who smooths consumption by lending or borrowing abroad, the model implies that the movements in the CA should reflect factors that affect a country's underlying saving and investment positions. Empirical studies of the inter-temporal approach followed two main directions. The first strand of the literature applies the present value tests developed by John Y. Campbell and Robert J. Shiller (1987) in the asset pricing context. A general idea is that one can derive the CA series that would have been optimal from a consumption smoothing perspective (see Steven M. Sheffrin and Wing Thyee Woo 1990 and Glen D. Otto 1992 for early applications). Typically, these models exhibited a poor empirical fit: while the model-predicted and the actual series are usually positively correlated, the latter series were substantially more volatile. Recent research moved to relaxing some of the models' assumptions, see overview in Jason M. Nason and John H. Rogers (2006). Overall, although relaxation of some of the assumptions improves the models' fit, the results are sensitive to the maintained assumptions and the choice of variables. In addition, the present-value tests do not distinguish between the temporary and permanent shocks driving the CA dynamics and hence are of limited applicability for assessing the CA sustainability, at least in the short to medium run perspective.

The second strand of the literature builds upon on a class of inter-temporal models with overlapping generations and uses standard econometric techniques to identify the relationships between the CA and a set of macro and socio-economic variables. The aim behind this literature is not to discriminate between the competing inter-temporal models. Rather, the idea is to capture as many potential influences on the CA as possible using a large number of variables in empirical analysis. Since the interest of the present study is to analyse current and past developments in the Serbia's CA, the latter approach appears to be better-suited for our purposes. Empirical literature in this vein is enormous (see, for example, Samya Beidas-Strom and Paul Cashin 2011, for a summary). Below we summarize the key findings in this strand of the literature.

Early literature on CA determinants focuses on the medium- to long-run determinants using dynamic panel data estimation techniques. Guy Debelle and Hamid Faruqee (1996) and later the International Monetary Fund's (IMF) methodology for exchange rate assessments (Consultative Group on Exchange Rate Issues - CGER 2006) study structural determinants of CA balances in industrial countries from the saving-investment perspective. Menzie D. Chinn and Eswar S. Prasad (2003) and Chinn and Hiroyuki Ito (2007), among others, extend this analysis to include developing countries. The findings of this literature are in line with theory, with most determinants displaying the expected signs, although with differing magnitudes or intensities across particular geographic regions.

Analyzing CA deficits in the new EU member states, Sabine Herrmann and Axel Jochem (2005) and Matthiew Bussière, Marcel Fratzscher, and Gernot J. Muller (2006) find that they can be attributed primarily to the relative income level and high capital building. They find that the positive impact of a closing income gap is largely compensated by real appreciation, while the effect of government budget deficits is

rather small. On the other hand, Paolo Zanghieri (2004) concludes that CA balance in new EU member states is significantly negatively affected by government deficits as well as financial deepening. Jesmine Rahman (2008) finds that FDI and the investment climate negatively affect CA balances in emerging Europe countries, while private remittances have the opposite effect.

Majority of empirical studies of the medium-term CA determinants employ panel regression techniques for estimation. This is reasonable since, on one hand, the idea is to include many different variables, while at the same time the data is available typically on annual basis, which implies relatively short samples for most of emerging and developing countries. A potential limitation with using panel analysis in this context is that the significance of potential determinants may differ across large number of countries and this heterogeneity may bias the resulting parameter estimates for individual countries. In order to overcome the problem in this paper we use model averaging techniques which allow us to include all of the relevant variables while simultaneously focusing on individual country's data only. We study a wide range of potential determinants of the CA behavior in Serbia and the selected CEE inflation targeting countries with flexible exchange-rates (the Czech Republic, Hungary, Poland and Romania). We find a significant heterogeneity in both signs and magnitudes of influence of potential determinants across countries in our sample, supporting the key premise behind our approach.

The contribution of the paper is twofold. First, to the best of our knowledge, this is the first paper that analyses the CA determinants for Serbia, at least over the past decade. Second, and in contrast to other empirical studies of Central and Eastern European countries, this is the first paper to use jackknife model averaging to control for model uncertainty. Michelle Ca'Zorzi, Alexander Chudik, and Alister Dieppe (2012) paper is the first that uses model averaging techniques for analysis of the CA determinants. They use Bayesian model averaging in a panel of 181 countries. Unlike them, we focus on individual country data thus controlling for potential parameter heterogeneity. Moreover, we use frequentist model averaging discussing also its benefits compared to the Bayesian approach (see Section 2).

The rest of the paper is organized as follows. Section 2 contains a discussion of our econometric methodology. Section 3 discusses the choice of CA determinants. Data and results from model averaging estimations are presented in Section 4. Section 5 concludes. In the Appendix we review the key CA determinants, their definitions and expected signs.

2. Econometric Methodology

Estimation of the singly-country CA determinants typically puts relatively strong limits on the number of variables to be included, even in the first step of general-to-specific exercise. A preferable solution for confronting parametric model uncertainty and limited number of observations is model averaging. Model averaging, unlike model selection, deals with model uncertainty by averaging over a set of candidate models in a particular manner, rather than selecting one model according to some criterion. By construction, model averaging is also more robust than model selection as the averaging estimator considers the uncertainty across different models together

with the model bias from each candidate model. Bruce E. Hansen (2007) showed that the frequentist averaging estimator can achieve lower mean-squared error than any individual estimator. Model averaging in the present context means that we use different combinations of the potential CA determinants (not all at once) as particular models. The final estimate is obtained by averaging across all of the estimated models using a suitable criterion to select individual models' weights. In this way, we are able to include a large number of variables typically found in the panel literature, while, at the same time, focusing our analysis on an individual country data.

The key element in empirical model averaging is the choice of the criterion for selecting the weights assigned to individual models. Both Bayesian and frequentist approaches have been proposed. Bayesian model averaging attaches probabilities to each individual model and then averages the models based on these probabilities. As common in Bayesian methods, application of the Bayesian averaging approach requires determination of prior probabilities for each model. Although this requirement can be transferred to specification of only one hyper-parameter - the expected model size (in our context, the number of variables in regressions), the choice of this parameter may have a significant influence on posterior (final) probabilities for individual models (see Eduardo Ley and Marc F. J. Steel 2009).

Frequentist model averaging, in contrast, selects models' weights using a suitable well-defined criterion. Different criteria have been proposed in the literature, see among others Stephene T. Buckland, Keneth P. Burnham, and Nicole H. Austin (1997), Hansen (2007) and references in Hua Liang et al. (2010). Most of the methods exclude heteroscedasticity and/or consider nested setup¹, which limits their applicability to the CA analysis. Recently, Hansen and Jeffrey S. Racine (2012) proposed the Jackknife Model Averaging (JMA) estimator for non-nested and heteroscedastic models where the weights are chosen by minimizing a leave-one-out cross-validation criterion. Chu-An Liu (2012) extends their results to cover the time series case and we apply this method in our empirical analysis.

In particular, let y_t denotes the CA to GDP ratio (the dependent variable), while X_t is the d -dimensional vector of explanatory variables (see Section 3). We are interested in estimating a following simple regression model:

$$y_t = X_t \beta + u_t \quad (1)$$

$$E(u_t | X_t) = 0 \quad (2)$$

$$E(u_t^2 | X_t) = \sigma^2(X_t) \quad (3)$$

where u_t is random error term that is allowed to be heteroscedastic and no assumption on the distribution of the error term is imposed. Let M be the number of models

¹ Nested in the present context means that one starts with a simple 2-variable regression (include variables X and Z for example), and then all subsequent candidate regressions (models) include expanding number of explanatory variables - (X,Z,W), then (X,Z,W,P) and so forth. Non-nested setup implies that one can also include combinations of variables that do not coincide, for example (X,Z,W), (P,Q,V) and so on.

where each model $m=1 \dots M$, represents a particular subset of the explanatory variables $X_{i,m}$ whose dimension is smaller than d . The OLS parameter estimate for the m^{th} model is, simply:

$$\tilde{\beta}_m = (X_m' X_m)^{-1} X_m' y \quad (4)$$

The averaging estimator for the full regression model is:

$$\tilde{\beta} = \sum_{m=1}^M w_m \tilde{\beta}_m \quad (5)$$

where weights w_m are assumed to be non-negative and sum up to one.

The JMA estimator selects the weights by minimizing a leave-one-out cross-validation criterion. Hansen and Racine (2012) show that the average squared error of the JMA estimator asymptotically attains the lowest average squared error among all feasible weight vectors. The leave-one-out estimate of the expected true error is:

$$CV_i(w) = \frac{1}{T} w' \tilde{u}_{-i}' \tilde{u}_{-i} w \quad (6)$$

where $\tilde{u}_{-i} = (\tilde{u}_{-i,1}, \dots, \tilde{u}_{-i,M})$ is a $T \times M$ matrix of leave-one-out residuals where $\tilde{u}_{-i,m}$ are the residuals from the m^{th} model estimated by least squares excluding the i^{th} observation. The jackknife choice of vector w_m is the value of w_m which minimizes $CV_i(m)$.

3. Current Account Determinants

Following the empirical evidence from a large number of studies for emerging and developing countries, below we outline the main prospective determinants of the CA behavior.² In the Appendix we summarize all variables, explain how they are calculated and provide their expected signs.

CA persistence. Studies show strong persistence in the CA movements. Theoretically, this can be related to habit formation in consumption and savings of countries or agglomeration effects in investment. Income inflows also tend to increase CA persistence. Other things being equal, countries running CA deficits for several years will accumulate debt that will generate income outflows in the subsequent periods.

Initial level of Net Foreign Assets (NFA). The level of NFA can have two opposite effects on the CA dynamics. On one hand, countries with higher NFA tend to benefit from higher net foreign income inflows (on accumulated net assets), implying a positive relationship between the NFA and the CA balance. On the other hand, countries with higher NFA can run larger trade deficits while remaining externally solvent, giving rise to a potentially negative relationship.

² We did not include demographic factors in the analysis since their effect on the CA may be present in the long-run and requires using lower than quarterly frequency of observations.

Oil trade balance. High dependence on oil imports and higher oil prices tend to directly increase the CA deficit.

Real effective exchange rate (REER). The REER is used as a measure of overall export competitiveness. By definition, an increase in REER implies appreciation of the exchange rate. We expect that depreciation of the REER should lead to CA improvement by making exports more attractive relative to imports (to domestic residents).

Trade integration - openness. Trade openness can have two opposite effects on the CA dynamics. On one hand, as a proxy for trade barriers (or the cost of trade), less open countries may improve the CA balance through lower imports. On the other hand, more open countries tend to generate larger foreign exchange earnings and have better ability to service the external debt making them more attractive for foreign capital. This, in turn, increases the available sources of external financing and relaxes the constraints on CA deficit financing.

The underlying assumption of inter-temporal approach to CA modeling is that movements in the CA are related to factors that affect country's underlying saving and investment positions. We therefore include several determinants of the investment-savings relation.

Economic growth. The link between the GDP growth and the CA balance is one of the key elements of the inter-temporal approach to CA modeling. Since the households are more likely to expect future income increases in a growing economy, they will be also more willing to increase their current consumption and consequently the CA balance may deteriorate.

Relative income. Small lower income economies are expected to have higher CA deficits due to a strong need for external financing of their economic and financial development. Conversely, as the country reaches mature stages of the development, its CA should improve since the country that expects to see its relative income diminishing in the future, should have a higher current savings rate (Charles M. Engel and John H. Rogers 2006).

Foreign direct investment (FDI) (lagged). The foreign direct inflows have been of significant importance for financing CA deficits of emerging economies. However, gross FDI inflows may also have a direct negative effect on the CA balance. Net effect depends on its import content and whether FDI increases investment or acquires existing capital stocks.

Terms of trade (ToT). Terms of trade may influence CA balance through savings and investments channels. Positive ToT shocks, *ceteris paribus*, lead to an improvement in CA balance via increase in savings due to larger current relative to permanent income (the Harberger-Laursen-Metzler effect). However, changes in ToT may also affect the optimal capital stock and hence the investment plans leading to worsening of CA. The prevalence of the channels depends on the persistence of ToT shocks - the greater the persistence, the more dominant is the investment effect.

Financial development. The overall effects of financial development on the CA are ambiguous. On one hand, it provides incentives for savings and potentially improves CA balance. On the other, it makes borrowing easier and, thus, leads to an increase in domestic demand. The latter effect may be dominant in emerging and developing countries.

Fiscal balance. To the extent that the full Ricardian equivalence holds, there should be no relation between the budget and CA deficits. The “twin deficit” hypothesis and different overlapping generations models, however, suggest the existence of a positive link between the two deficits.

Structural changes. To take into the account potential outliers in the data we include dummy variables (see the Appendix for details).

4. Data and the Results

The majority of the data, for compatibility reasons, come from the EUROSTAT database. For REER we use the World Banks’ World Development Indicators (WDI) database. The quarterly data on NFA come from the national central banks’ databases and EUROSTAT. The weights for trading partners are based on the average importance of each country as export destination for all countries in our sample; they are calculated using the COMTRADE data for 2002-2004 and 2008-2010. The final weights include 25 largest trading partners, which constitute around 80% of the value of overall non-oil exports. Data for Serbia come from the National Bank of Serbia (NBS) and National Statistical Office. The longest time period for which all of the data are available is 2000:Q1 to 2011:Q4 for the Czech Republic. Sample for Hungary and Poland covers period from 2000:Q2 to 2011:Q4, for Romania from 2002:Q1 to 2011:Q4 and for Serbia the period from 2002:Q2 to 2011:Q4.

Before applying the model averaging to study the determinants of the CA movements we check the order of integration of the individual series as the methodology is valid only in case of stationary variables. Table 1 presents the results from the Denis Kwiatkowski et al. (1992) KPSS test of a null hypothesis that an observable time series is stationary. A careful examination of the series for which KPSS rejects the null of stationarity suggests the presence of structural breaks. To control for structural breaks we implement Eric Zivot and Donald W. Andrews (1992) test and the results suggest the stationarity of all series. Although the length of the sample is relatively short, the results suggest the stationarity of the CA series, giving also some support for (in sample) CA sustainability.

Table 2 presents the main results of this section. We estimate all possible models with four, five and six variables included (2211 models in total) for each country in our sample. The reported estimates are the weighted averages of the (non-zero weight) models. Different signs and magnitudes of coefficients indicate heterogeneity among countries providing empirical support for the country-level analysis.

All variables are found to be significant (at least for some countries) and have expected signs and magnitudes mostly in line with the existing empirical literature.

Second row of Table 2 shows relatively higher persistence of the CA balances in Hungary, Poland and Romania compared to Serbia and Czech Republic, indicating slower CA adjustment to transitory shocks for these countries. Coefficient on the *NFA stock* is negative for the Czech Republic, Hungary and Romania. Since the NFA was worsening over the past decade, this implies that reaching higher negative levels of the foreign exposure imposes a (more binding) constraint on worsening of the trade balance (depending on a structure of the NFA) and a stimulus for the CA im-

Table 1 Unit Root Tests Results

Country	Serbia		Romania		Hungary		Poland		Czech Republic		
	Variable/test	KPSS	Zivot-Andrews	KPSS	Zivot-Andrews	KPSS	Zivot-Andrews	KPSS	Zivot-Andrews	KPSS	Zivot-Andrews
Current account	0.140		0.170		0.186**	0.000***	0.152		0.092		
Current account (-1)	0.198		0.162		0.179**	0.000***	0.171		0.103		
NFA	0.149*	0.002***	0.169*	0.025**	0.112		0.074		0.052		
Oil balance	0.141		0.076		0.086		0.077		0.086		
REER	0.105		0.126*	0.017**	0.184**	0.026**	0.063		0.069		
Trade openness	0.117		0.138*	0.006***	0.148**	0.000***	0.152**	0.000***	0.113		
GDP growth	0.135		0.083		0.115		0.099		0.194**	0.044**	
FDI	0.189*	0.012**	0.280		0.078		0.125		0.054		
Relative income	0.086		0.064		0.120*	0.029**	0.189		0.113		
ToTshocks	0.056		0.541**	0.000***	0.114		0.081		0.158		
Financial development	0.093		0.110		0.060		0.146		0.175**	0.009***	
Fiscal balance	0.090		0.141		0.524**	0.008**	0.173		0.500***	0.000***	

Notes: * significant at 10% percent level; **significant at 5% percent level; ***significant at 1% percent level; In KPSS test the stationarity null hypothesis is tested against the alternative of unit root. Zivot and Andrews (1992) $t(\alpha)$ -test. H0: I(1) without break; HA: I(0) with one endogenous break in the in the trend function.

Source: The authors.

Table 2 Parameter Estimates and Average CA Contributions

	Coefficient estimates					Average contributions				
	Serbia	Romania	Hungary	Poland	Czech Republic	Serbia	Romania	Hungary	Poland	Czech Republic
Constant	-2.535	0.862	-2.618	3.846	1.977	-2.535	0.862	-2.618	3.846	1.980
Lagged dependent	0.327	0.599	0.736	0.659	0.133	-3.317	-4.543	-4.117	-2.847	-0.480
Initial NFA	0.007	-0.017	-0.018	0.005	-0.027	-0.350	0.693	1.604	-0.214	0.770
Oil balance	0.473	0.569	0.189	0.195	-	-1.945	-0.736	-0.651	-0.468	-
REER	-0.247	-0.409	-0.041	-0.317	-0.056	-1.152	-1.873	-0.188	-1.452	-0.262
Trade openness	-0.001	0.000	0.021	-0.013	-0.031	0.002	-0.003	1.414	0.123	-1.137
Real GDP growth	-0.378	-0.539	-0.075	-0.013	0.051	-0.161	-0.364	-0.008	-0.008	0.017
FDI	-0.295	-0.278	-0.111	-0.008	-0.088	-1.449	-1.435	-0.510	-0.031	-0.531
Relative income	0.005	-	0.008	0.064	0.114	-0.140	-	-0.327	-3.178	-3.921
Financial development	-0.063	-0.002	-	-0.020	0.000	-0.257	-0.208	-	-0.052	-0.071
Fiscal balance	0.124	0.019	0.019	0.003	0.026	0.180	-0.018	-0.035	-0.005	-0.026
Terms of trade	-	0.025	0.089	-	-0.068	-	0.002	-0.001	-	0.000
Dummy for VAT, crisis and remittances	6.487	1.527	1.435	0.506	-2.248	0.487	0.153	0.060	0.053	0.094
Model CA						-10.636	-7.470	-5.377	-4.233	-3.576
Actual CA						-10.708	-7.492	-5.401	-4.244	-3.592
R ²	0.379	0.698	0.761	0.614	0.521					

Source: The authors.

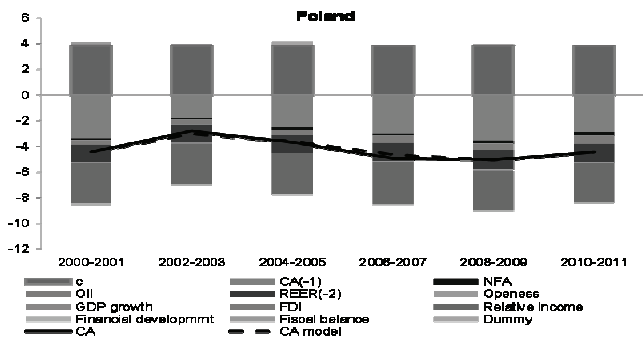
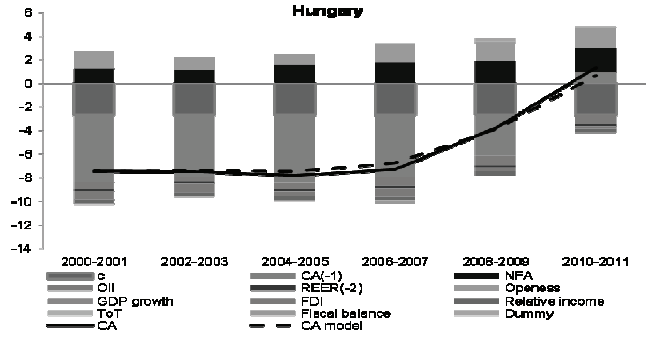
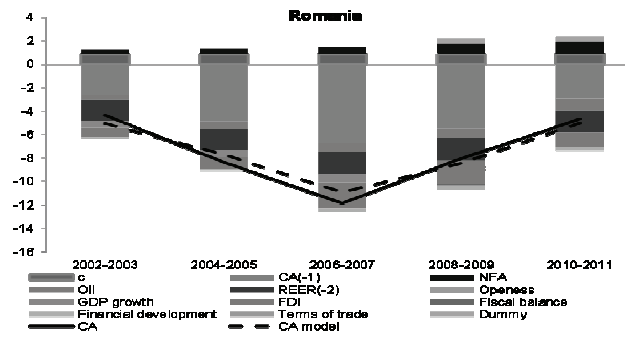
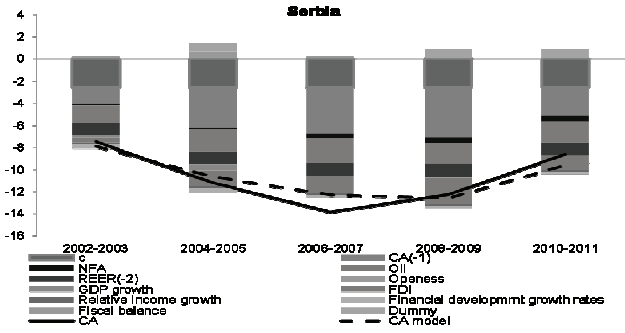
provements. The *oil balance* is contributing negatively in all countries apart from the Czech Republic, although its influence becomes stronger in the less developed countries (Romania and Serbia). The fact that the estimated coefficient is smaller than one implies that imports of other goods may compress as the oil prices increase. *REER*³ is also contributing negatively to the CA in all countries. This effect is higher in Serbia, Romania and Poland indicating stronger effects of real appreciation to CA deterioration in these countries and implying some role for the exchange rate policy in the external adjustment. Conversely, the *trade openness* has different effect among the

³ We separately estimated specifications where the REER is defined using various moving averages windows and selected the specification which maximizes the R² (since two separate REERs cannot be included in the model averaging procedure).

countries - it tends to improve the CA in Hungary, while the effect is negative in all other countries. Since Hungary is the country with the largest openness ratio in our sample, this seems to suggest the existence of a threshold after which the higher trade integration brings a positive effect on the CA. *Real GDP growth* contributes negatively to CA balance for all countries except for Czech Republic where the opposite sign is observed. This may be due to the fact that GDP growth in Czech Republic was driven by net exports which also contributed to CA improvement. Higher “catching up” effect led to larger contributions of *real GDP growth* and *FDI* to CA deficits in Serbia and Romania. Analogously to Herrmann and Jochem (2005) we find significant impact of *relative income* to CA balance in Poland and Czech Republic. This finding indicates the ability of convergence process to explain a large part of the past deficits in these countries. As in Rahman (2008) *financial development* measured by private sector credit to GDP is negatively affecting CA balance. The effect was more pronounced in Serbia and Romania, indicating larger credit activity expansion in these countries. Positive coefficient on *fiscal balance* in all countries supports the “twin deficits” hypothesis. However, except for Serbia where fiscal balance contributed positively to CA balance due to privatization revenues, in other countries the contribution was negative, since the fiscal deficit of these countries was higher relative to their main trading partners. *Terms of trade* have a more diverse influence. They contribute to CA improvement in Romania and Hungary, suggesting the dominance of the savings channel, whilst investment effect is prevalent in the Czech Republic.

Figure 1 reports actual CA, model CA and contributions (two-year averages) for select CEE countries. In line with CGER (2006) high contribution of CA persistence is seen for all countries, except for the Czech Republic. This finding may suggest that CA persistence is driven not just by habit persistence, but also income outflows generated by debt accumulation from previous periods, since these outflows are the largest negative component of CA balance for the majority of the countries in our sample (Hungary, Poland and Czech Republic). In Serbia, the negative oil balance, the FDI inflows and the REER appreciation significantly contributed to the CA balance deterioration. Similarly, the CA balance in Romania is significantly affected by the FDI inflows and REER movements, although the latter has slightly larger contribution. Both Poland’s and the Czech’s CA deficits are largely explained by the relative income convergence. However, while REER has higher impact in Poland, the trade openness plays a more important role in explaining CA developments in the Czech Republic. Oil balance and FDI inflows had the largest negative effect in Hungary where trade openness and negatively expanding NFA position yield improvements in the CA balance.

Looking at dynamics, the largest change in contributions to CA balance in Serbia and Romania is seen for the FDI inflows which contributed increasingly to the deficit over 2002-2009, while its contribution in both countries fell more than one percentage point over 2010-2011. Lower consumption (as evident from CA persistence dynamics) and FDI inflows accompanied by increasingly positive contribution of trade openness were behind CA reversal in Hungary in the last two-year period. The importance of the main determinants of Poland’s CA balance contrary remained relatively stable over the sample. In the Czech Republic the NFA significantly increased its contribution to the CA balance, while the FDI inflows become less influential.



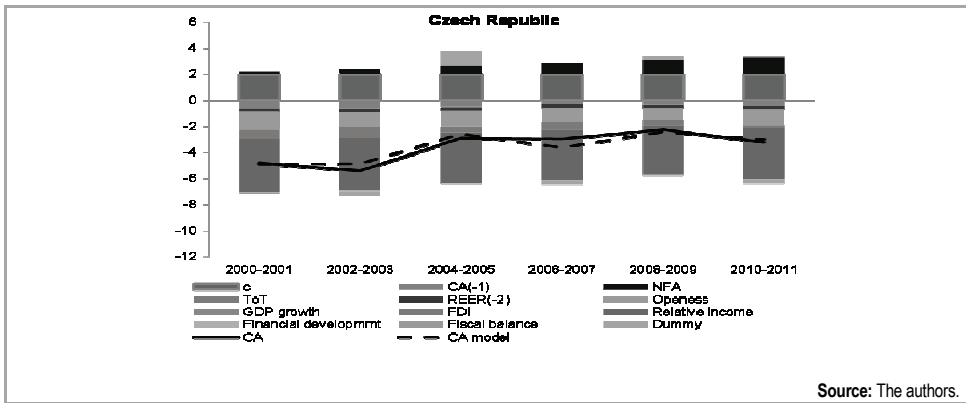


Figure 1 Actual CA, Model CA and Contributions to CA Balance - Two-Year Averages, as Percentage of GDP

Figure 2 shows that the model tracks the past CA movements rather well for countries in our sample. It captures relative volatility of the CA as well as CA trends in both depreciation and appreciation periods.

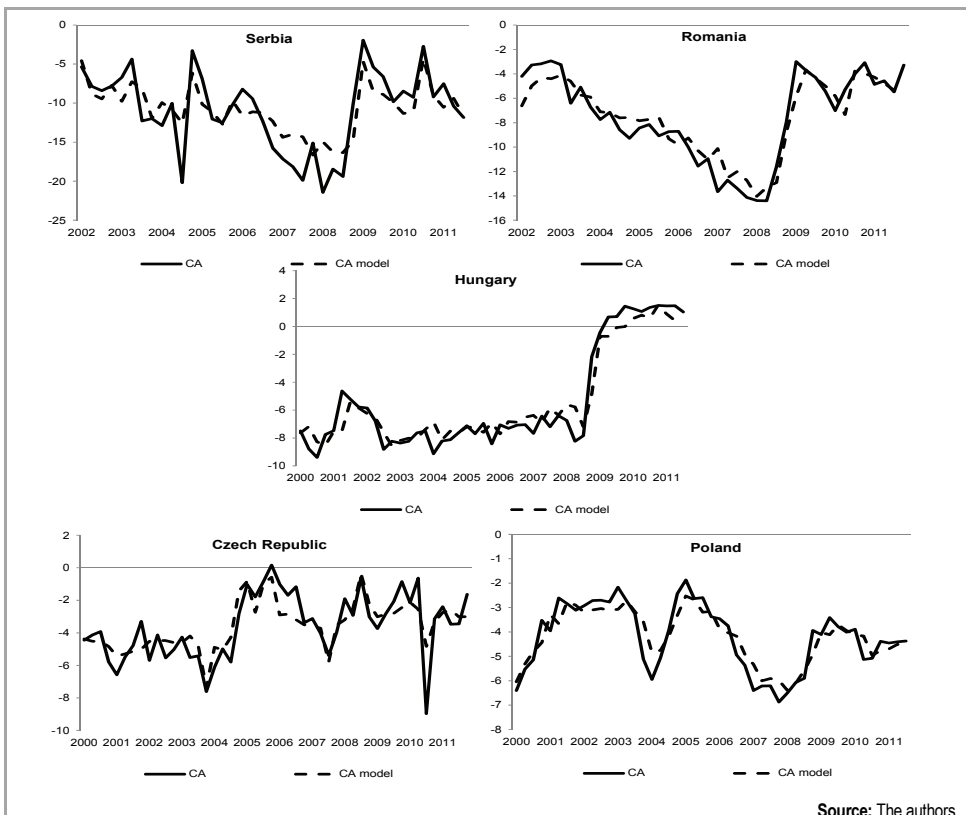


Figure 2 Actual vs. Model CA, as Percentage of GDP

5. Concluding Remarks

We study determinants of CA balances in CEE inflation targeting countries (the Czech Republic, Hungary, Poland, Romania and Serbia) over the past decade. Using model averaging techniques we focus the analysis to individual country's data only and find a large heterogeneity in signs and magnitudes of influence of potential determinants among countries. The results for all five countries suggest that the model tracks CA movements over the past decade quite well. In particular, negative oil balance, the FDI inflows and REER appreciation significantly contributed to the CA deterioration in Serbia. CA balance in Romania is similarly negatively affected by the FDI inflows and REER movements. In contrast, both Poland's and Czech's CA deficits are largely explained by the relative income convergence. The estimates for Hungary suggest that higher trade integration and negatively expanding NFA position tend to improve the CA balance.

We believe that this paper presents a good starting point for assessing individual country's external position sustainability. Namely, one could use identified influences of macro-variables on CA balance to analyze the future paths of the NFA under different scenarios on the evolution of the determinants. In this way, it would be possible to generate a rich set of possible outcomes for the external position of the country while not imposing any steady-state assumption on the evolution of the economy. Focusing on the NFA relates to the other side of the sustainability coin – the CA deficits are sustainable as long as foreigners are willing to finance it, which is, in turn, ultimately connected to the accumulated level of the NFA.

References

- Beidas-Strom, Samya, and Paul Cashin.** 2011. "Are Middle Eastern Current Account Imbalances Excessive?" International Monetary Fund Working Paper 195.
- Buckland, Stephene T., Kenneth P. Burnham, and Nicole H. Austin.** 1997. "Model Selection: An Integral Part of Inference." *Biometrics*, 53(2): 603–618.
- Bussière, Matthiew, Marcel Fratzscher, and Gernot J. Muller.** 2006. "Current Account Dynamics in OECD and New EU Member States: An Intertemporal Approach." *Journal of Economic Integration*, 21: 593–618.
- Ca'Zorzi, Michelle, Alexander Chudik, and Alister Dieppe.** Forthcoming. "Thousands of Models One Story: Current Account Imbalances in the Global Economy." *Journal of International Money and Finance*.
- Cambell, John Y., and Robert J. Shiller.** 1987. "Cointegration and Tests of Present Value Models." *Journal of Political Economy*, 95(5): 1062–1088.
- Chinn, Menzie D., and Eswar S. Prasad.** 2003. "Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration." *Journal of International Economics*, 59(1): 47–76.
- Chinn, Menzie D., and Hiroyuki Ito.** 2007. "Current Account Balances, Financial Development and Institutions: Assaying the World Saving Glut." *Journal of International Money and Finance*, 26(5): 546–569.
- Debelle, Guy, and Hamid Faruque.** 1996. "What Determines the Current Account? A Cross-Sectional and Panel Approach." International Monetary Fund Working Paper 58.
- Engel, Charles M., and John H. Rogers.** 2006. "The U.S. Current Account Deficit and the Expected Share of World Output." *Journal of Monetary Economics*, 53(5): 1063–1093.
- Hansen, Bruce E.** 2007. "Least Squares Model Averaging." *Econometrica*, 75(4): 1175–1189.
- Hansen, Bruce E., and Jeffrey S. Racine.** Forthcoming. "Jackknife Model Averaging." *Journal of Econometrics*.
- Herrmann, Sabine, and Axel Jochem.** 2005. "Determinants of Current Account Developments in the Central and East European EU Member States." Deutsche Bundesbank Research Paper 05-32.
- International Monetary Fund.** 2006. "Methodology for CGER Exchange Rate Assessments." International Monetary Fund Occasional Paper 283.
- Jordà, Òscar, Mortz Schularick, and Alen M. Taylor.** 2011. "Financial Crises, Credit Booms, and External Imbalances: 140 Years of Lessons." *International Monetary Fund Economic Review*, 59(2): 340–378.
- Kamin, Steven B., John W. Schindler, and Shawna L. Samuel.** 2007. "The Contribution of Domestic and External Factors to Emerging Market Devaluation Crises: An Early Warning Systems Approach." *International Journal of Finance and Economics*, 12(3): 317–336.
- Kwiatkowski, Denis, Peter C. B. Phillips, Peter Schmidt, and Yongcheol Shin.** 1992. "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root." *Journal of Econometrics*, 54(1-3): 159–178.
- Ley, Eduardo, and Marc F. J. Steel.** 2009. "On the Effect of Prior Assumptions in Bayesian Model Averaging with Applications to Growth Regression." *Journal of Applied Econometrics*, 24: 651–674.

- Liang, Hua, Guohua Zou, Alan Wan, and Xinyu Zhang.** 2011. "Optimal Weight Choice for Frequentist Model Average Estimators." *Journal of the American Statistical Association*, 106(496): 1053–1066.
- Liu, Chu-An.** 2012. "A Plug-In Averaging Estimator for Regressions with Heteroskedastic Errors." <http://faculty.chicagobooth.edu/midwest.econometrics/Papers/MEGCLiu.pdf>.
- Nason, Jason M., and John H. Rogers.** 2006. "The Present-Value Model of the Current Account has been Rejected: Round Up the Usual Suspects." *Journal of International Economics*, 68(1): 159-187.
- Obstfeld, Maurice, and Kenneth S. Rogoff.** 1996. *Foundations of International Macroeconomics*. Cambridge: MIT Press.
- Otto, Glen D.** 1992. "Testing a Present-Value Model of the Current Account Evidence from U.S. and Canadian Times Series." *Journal of International Money and Finance*, 11(5): 414-430.
- Rahman, Jesmine.** 2008. "Current Account Developments in New Member States of the European Union." International Monetary Fund Working Paper 92.
- Sachs, Jeffrey D.** 1981. "The Current Account and Macroeconomic Adjustment in the 1970s." *Brooking Papers on Economic Activity* 1: 201-268.
- Sheffrin, Steven M., and Wing Thye Woo.** 1990. "Present Value Tests of an Intertemporal Model of the Current Account." *Journal of International Economics*, 29(3-4): 237-253.
- Zanghieri, Paolo.** 2004. "Current Accounts Dynamics in New EU Members: Sustainability and Policy Issues." Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) Working Paper 2004-07.
- Zivot, Eric, and Donald W. Andrews.** 1992. "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis." *Journal of Business and Economic Statistics*, 10(3): 251–270.

Appendix

Table A1 Variable Descriptions and Their Expected Signs

Variable/regressor	Expected sign	Variable description
Constant	ambiguous	-
Lagged dependent	+	Lagged CA to GDP ratio
Initial NFA	ambiguous	Net Foreign Assets to GDP ratio, at beginning of period to avoid the balance sheet link from the CA balance on the NFA at the end of the period
Oil balance	+	Oil trade balance to GDP ratio
REER *	-	Logarithm of trade-weighted real exchange rate, four quarter moving average, from 2 to 6 previous quarters
Trade openness	ambiguous	Ratio of total exports and imports to GDP
Real GDP growth	-	Difference between real GDP growth and the weighted average of the trading partners GDP growth
FDI *	-	FDI inflows to GDP ratio, four quarter moving average, from 4 to 8 previous quarters
Relative income	+	Difference between the real GDP per capita and the weighted average of the trading partners GDP per capita
Terms of trade shocks	ambiguous	Residuals from the terms of trade autoregression
Financial development	-	Private sector credit to GDP ratio
Fiscal balance	+	Difference between fiscal balance and the weighted average of the trading partners fiscal balances
Dummy for VAT, crisis and remittances	ambiguous	VAT introduction, 2008-2009 crises and high remittance inflows for Serbia, EU accession and 2008-2009 crisis dummy for other countries

Note: Since agents do not react to REER changes immediately, average changes in REER rather have cumulative effect, we measure REER as four quarters moving average. We also measure FDI as four quarters moving average to include their long run effects on CA balance.

Source: The authors.

THIS PAGE INTENTIONALLY LEFT BLANK