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## ECONOMETRIC ANALYSIS OF THE EXTERNAL FINANCIAL STABILITY OF THE VISEGRAD COUNTRIES AND UKRAINE

### Summary

In the paper, we analyse relationships between the current and capital account balance (CCA), its components and the rate of exchange, on one hand, and GDP, on the other, in the Visegrad countries (V4) and Ukraine on yearly data in 1994-2015. The assumptions, the method of analysis and the results of our study of these relationships are discussed in details. We found that in all V4 countries (except Slovakia) and Ukraine there were negative relationships between the current and capital account changes and GDP. In all countries, the rate of exchange depreciation used to cause decrease of the level of GDP. We discovered also a strong long-term dependence of their GDP level on their foreign trade, in spite of a growing financial development, especially after 2004. On the other hand, the relations between capital components of the CCA and GDP in all analysed countries turned out to be relatively weak. The strength and direction of the impact of the analysed variables on GDP can indicate the systemic weakness of foreign financial stability and points to the inherent risks associated with the sudden changes of some of most sensitive parts of the current and capital account.

**Key words:** balance of payments, current and capital account balance, components of current and capital account balance-to-GDP ratio, external financial stability, Visegrad countries, Ukraine.

**JEL codes:** F02

### Introduction

We we claim that the current and capital account and its components affect level of GDP thus changing countries' growth and stability. Therefore, it is important to identify the numerical values of current account balance and its components to GDP relationships because they may be considered as proxies for country external vulnerability. The level and dynamics of the current account balance compared with the level and dynamics of GDP is one of universal

measures of the external stability of the economy (IMF 2014a; IMF 2014b; De Gregorio 2014; Forbes et al. 2016; Sawicki 2016).

The external financial stability refers to a country's capacity to service, autonomously and without any shock, its net external liabilities. They are the result of the cumulated net foreign capital flows, recorded on the current account of the balance of payments. The current account deficits need to be financed by foreign net financial flows, i.e. through selling debt, equities, acquiring commercial banks loans and/or by trading accumulated international reserves.

The lack of financial stability in the situation of external or internal shocks could generate environment for financial crisis. Therefore although the current account deficit could be perceived as the optimal allocation of global capital flows, as in Lucas paradox (Lucas 1990), or models of the current account that assume inter-temporal optimization, as we find in Lawson's Doctrine (Edwards 2002), the unforeseen 1990's crises (Błaszczuk 2001) located issue of the current account sustainability in the center of policy decisions (Edwards 2002). The balance of payments role in the financial crisis was evident in times of Mexico crisis (1994), Asian financial turmoil (1997) and recently in euro-zone (2010) (Catão & Milesi-Ferretti 2013). The noticeable lesson from the recent crises is that growth's reliance on foreign capital inflow is dangerous not only for the emerging economies (Rajan 2016).

Analyzing bygone crises, it is reasonable to accept a fact that financial stability of any country weakens when investors lost confidence in its ability to manage at the normal market conditions service and repayment of its accumulated foreign obligations. The growing uncertainty and risk aversion at the world market make country vulnerable to sudden retrenchments, flights or stops of the capital waves.

Forbes and Warnock (Forbes, Warnock 2011) show that "sudden stops" are correlated with currency depreciations, higher interest rates and slower growth. When financially vulnerable economy encounters borrowing constrains e.g. due to business cycle, i.e. rising credit costs, growing supply constraints, additional collaterals requirements etc. or due to a kind of "black swans" explained by N. Taleb (2010), then probability of its financial crisis rises. Another reason for financial disturbances is often an excessive lending (Bennardo et al. 2014) resulting from the information asymmetry (Verdier 2002). Then an external or internal shock like in a bifurcation models (Barnett et al. 2015) breaks normal financial relations between particular economy and its trade and financial partners. To this end we acknowledge also M. Obstfeld's three (related) reasons why prolong and excessive current account deficits may lead to financial vulnerabilities, there are: (1) "sudden stops" or/ and sudden retrenchment in capital flows; (2) a deterioration of the net foreign liabilities position and (3)

macroeconomic imbalances due to high demand elasticity of imports and low competitiveness of exports (Obstfeld et al. 2008; Obstfeld 2012a).

All the while the foreign liabilities grow and finance primarily production of non-traded goods, export capacity (economic competitiveness) remains poor and the import elasticity of GDP stays elevated and foreign trade becomes the structural problem. Moreover, when capital flows are asymmetric, as in a case of V4 countries, growing costs of capital could expand and worsen conditions of the foreign debt service, increase deficit and reduce national income in a sense presented e.g. by Piketty (2014).

Therefore, it is not only dilemma how to stop or reduce foreign debt level but by doing this do not reduce the level of GDP. Therefore, an economy needs to generate income sufficient to fulfill foreign obligations. The importance of the deficit for the financial stability depends then on its relationships with GDP.

We find relations between financial components of the current and capital account and GDP especially because as indicated by K. Forbes et al. (2016) much more rapid adjustments can occur through financial channels than through foreign trade ones. Authors presented the correlation between net exports and other (non-trade) components of the balance of current and capital account. Financial factors such as foreign investment flows can be large, important and fast changing. They could have important influence on GDP stability and growth. In addition to net investment income, in several countries, the transfers (current and capital) are of particular importance. Some transfers are autonomous as foreign employees' compensations being the result of international agreements, e.g. the Treaty of the European Union (EU 2017). If the current account balance depends on that kind of the capital inflows its stability could be jeopardized as dependent on factors not directly connected with the economic fundamentals of the beneficiary.

## Some Theoretical Considerations on the Relationships between the Current Account and GDP

The standard version of the current account and capital definition takes the following form:

$$CCA_t = SH_t + D_{t-1} * z_t + T_t \quad (1)$$

CCA – current and capital account balance

D – net foreign liabilities

SH – foreign trade balance

T – current and capital transfers

$z_t$  – weighted (by share of foreign assets and liabilities) return on net foreign investment

The current and capital account balance is a linear function of the trade balance (SH) and a financial component which can be decomposed into: net primary investment incomes other primary incomes, secondary incomes and capital transfers. This split matches the IMF statistical manual MBP6 (IMF 2009). It is used also by all V4's and Ukraine's central banks.

In order to determine the relationships between GDP and the CCA variables in equation (1) are transformed into national currency, and then both sides are divided by GDP denominated in local currency in period  $t$ :

$$\frac{(CCA_t * \phi_t)}{Y_t} = \frac{(SH_t * \phi_t) / Y_t + [\phi_t * D_{t-1} * z_t] / [Y_{t-1} * (1 + r_t)] + (T_t * \phi_t / Y_t)}{\quad} \quad (2)$$

where, in addition to previously explained:

$\phi_t$  – exchange rate of foreign currency in the domestic currency in period  $t$ ,

$r_t$  – GDP growth rate in the period  $t$

Indicating by lowercase letters the relations between: current account balance, accumulated foreign net liabilities, transfers and the GDP, we get:

$$cca_t = sh_t + (d_{t-1} * z_t) / (1 + r) + t_t \quad (3)$$

From equation (3) we find that the ratio of current account to GDP in period  $t$  depends on: (1) the realized in period  $t$  trade balance, (2) accumulated during period up to  $t-1$  foreign debt, (3) current and capital transfers in period  $t$  – all related to GDP in  $t$  and (4) the relationships between the cost of foreign debt servicing (dependent on the intrinsic interest rates and as well as the efficiency of the foreign direct investments) and the rate of growth of GDP in period  $t$ .

When we measure relationship between CCA and GDP in foreign currency as it is presented by IMF, we have to divide the CCA expressed in foreign currency by GDP converted into foreign currency:

$$\frac{(CCA_t)}{(Y_t * \phi'_t)} = \frac{(SH_t) / (Y_t * \phi'_t) + [(D_{t-1}) / (Y_{t-1} * \phi'_{t-1})] / [(1 + r_t) * \frac{\phi'_t}{\phi'_{t-1}}] + T_t / (Y_t * \phi'_t)}{\quad} \quad (4)$$

From equation (4) we learn that the depreciation of the national currency influences relationships between the CCA and GDP the more the greater is the difference between growth rate of GDP and level of depreciation. In other words, when depreciation initiates the improvements of the current and capital account at the same time it causes reduction of the level of GDP.

Putting it differently, if the current account (for simplicity, apart from current and capital transfers) represents the identity  $RB \equiv SH + D$ , then the change of the current account

$$G_{CA} = SH/CA * G_{SH} + D/CA * G_D \quad (5)$$

where  $G$  is the growth rate per unit of time of a subscripted variable.

From equation (5) we find that the rate of change of the balance on current account depends on the pace of changes in net exports corrected by

relationships of net exports to the current account balance and the rate of change of the investment income in the current account, corrected by their share in the balance of current account. It shows that the improvement of the balance on the current account is visibly path dependent (Liebowitz & Margolis 1995) (Benczes 2014).

In order to keep financial stability in a steady state GDP change should be equal to the change of the current account:

$$G_{GDP} = SH/CA * GSH + D/CA * G_D \quad (6)$$

In equation (6) we omit transfers, which as we already mentioned, are not directly connected with the economic fundamentals of the beneficiary.

## The Empirical Analysis of the Relationships between the CCA Balance and GDP

### Assumptions

The study is based on the annual data published by OECD (2016) and IMF (IMF, 2016) for the longest possible period (1994-2015), so the last two Juglar business cycles (Korotayev & Tsirel 2010) are covered. This allows regard discovered dependences as long-term ones. In order to compare the results of V4 we use data at current prices in US dollars. To eliminate influence of trends in the analysed time series we introduced variable  $t$ . We assumed that the relationships between levels of GDP and current and capital account can be expressed by, let us call it, the basic linear function:

$$GDP_{jt}^l = \beta_{0j}^l + \beta_{1j}^l * t + \beta_{2j}^l * CCA_{jt} + \xi_{jt}^l \quad (7)$$

where

$j = 1, 2, 3, 4$  – Czech Republic, Hungary, Poland, Slovakia;

$t = 1, 2, \dots, 22$  – 1994, 1995, ..., 2015.

As the current account balance is correlated with the change of rate of exchange, we enhanced equations (7) by nominal rate of exchange variables. We have assumed consequently that the relationships between the levels of GDP and the current and capital account as well as the rate of exchange can be expressed by the following linear function:

$$GDP_{jt}^l = \beta_{0j}^l + \beta_{1j}^l * t + \beta_{2j}^l * CCA_{jt} + \beta_{3j}^l * \varphi_{jt} + \xi_{jt}^l \quad (8)$$

Further we assumed that equations can be estimated using the ordinary least squares method (OLS). Moreover, at the stage of verification of individual equations, we removed (one by one) variables that were the most statistically insignificant.

At the final stage, we took account that in the analysed period two important facts took place: first, the largest since the Great Depression global economic crisis of 2007-2008 and subsequently the debt crisis in the EMU and second, in these years all V4 countries benefited from the EU current and capital transfers. To identify the hypothetical shock periods for each of the analysed economies we used the trial and error method basing on equation:

$$GDP_{jt}^l = \beta_{0j}^l + \beta_{1j}^l * t + \beta_{2j}^l * CCA_{jt} + \beta_{3j}^l * \varphi_{jt} + \beta_{4j}^l * ZS_t + \xi_{jt}^l \quad (9)$$

where  $Z^- = 1$  for  $SSR < -2.0$  and  $Z^+$  for  $SSR > 2.0$ ; 0 otherwise.

Analysing data series we found, using the augmented Dickey-Fuller test (ADF) (Cottrell & Lucchetti 2016) that all variables in equation (8) (except time, of course) are non-stationary. Moreover, using Johansen and Engle-Granger test (Granger 2001) we found that three variables in equation (8) are not cointegrated. Therefore, we decided to eliminate non-stationarity. We found that the first difference for the Czech Republic, second differences for the Hungary, Poland and Slovakia and the third differences for Ukraine are stationary. We studied relationships between GDP and two exogenous variables with help of the impulse response function (IRF) that illustrates, under certain simplified assumptions, the response of one variable to shock imposed on the other one (Granger 2001). We constructed this function on the basis of vector autoregression model (VAR)<sup>1</sup>. In our analysis we used an econometrics package GRETL (Cottrell & Lucchetti 2016).

At the end we analysed the relationships between GDP and the components of the balance of current and capital account (CCA) using the following equation:

$$GDP_{jt}^l = \beta_{0j}^{l+} + \beta_{1j}^{l+} * t + \beta_{2j}^{r1} * CCA_{jt}^{r1} + \dots + \beta_{2j}^{r9} * CCA_{jt}^{r7} + \xi_{jt}^l \quad (10)$$

where,

r – components of the CCA: r1- exports of goods; r2 – imports of goods; r3 – services balance; r4 – direct investments incomes; r5 – portfolio investments incomes; r6 – other incomes + current transfers; r7 – net capital transfers.

## Results

The results of the estimates we found, in all V4 countries and Ukraine, reveal negative response of GDP (measured in USD) to the decrease of the CCA balance (deficit) although reactions force and their statistical significance are quite different (see Table 1).

<sup>1</sup> It is used when there is no cointegration among the variables and it is estimated on time-series that have been transformed into stationary ones (Cottrell & Lucchetti 2016).

**Table 1. Results of the Estimates of the Basic Equations**

CZECH REPUBLIC			HUNGARY		
R Square	0.869		R Square	0.902	
Adjusted R Square	0.855		Adjusted R Square	0.892	
	<i>Coefficients</i>	<i>t Stat</i>		<i>Coefficients</i>	<i>t Stat</i>
Intercept	7 406	0.5	Intercept	11 202	1.5
t	10 270	11.0	t	6 944	12.7
CCA	-3.8	-2.0	CCA	-2.4	-4.0
POLAND			SLOVAK REPUBLIC		
R Square	0.919		R Square	0.881	
Adjusted R Square	0.911		Adjusted R Square	0.868	
	<i>Coefficients</i>	<i>t Stat</i>		<i>Coefficients</i>	<i>t Stat</i>
Intercept	41 492	1.9	Intercept	-3 017	-0.5
t	22 695	14.2	t	4 887	11.8
CCA	-2.4	-2.2	CCA	-0.9	-0.8
UKRAINE					
R Square	0.893				
Adjusted R Square	0.881				
	<i>Coefficients</i>	<i>t Stat</i>			
Intercept	26 810	3.1			
t	4 586	6.2			
CCA	-5.0	-6.2			

Source: the Authors' calculations.

In all analysed economies, except the Slovak Republic these negative responses of GDP to the CCA changes were statistically significant (see column 3 and 6 in Table 2).

**Table 2. GDP Relationships with CCA**

Country	GDP % response to 1% average CAA decline
The Czech Republic	-6.47
Hungary	-3.74
Poland	-5.52
The Slovak Republic	x <sup>a)</sup>
Ukraine	-13.45

a) Relationship is not significant statistically.

Source: as in Table 1.

The most sensitive economy as concerns their dependencies between the CCA and GDP was Ukraine. In Poland, the Czech Republic and Hungary GDP response to 1% CCA change was similar after we normalised changes to the average levels of GDP. Interestingly in the Czech Republic GDP is twice as

sensitive to CCA changes as we found in Hungary. At the same time in Slovakia the relationships between GDP and CCA was as we indicated statistically insignificant.

In statistical terms the results of estimates of equation (8) which includes also rate of exchange proved to be accurate (see Table 3). The values of the adjusted coefficient of determination for all models are very high, generally, they are well above 0.95. Thus, in every case well over 95% of the variation of GDP was explained by variation of the exogenous variables. At the same time, the Durbin – Watson (DW) statistics was in intervals:  $d_U < DW < 4 - d_U$  or a short distance to the left from that range. Thus, we can assume that when in the estimated equations, the positive autocorrelation of the random component is present, it is poor. As the structural parameters are statistically significant it is important to find their economic explanation.

**Table 3. Results of the Regression between CCA, the Rate of Exchange and GDP**

CZECH REPUBLIC				HUNGARY				POLAND			
R Square	0.981			R Square	0.988			R Square	0.988		
Adjusted R Square	0.977			Adjusted R Square	0.986			Adjusted R Square	0.985		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	155 466	8.1		Intercept	62 503	12.1		Intercept	265 169	10.5	
t	6 828	12.6		t	7 688	37.4		t	22 830	35.3	
rate of exchange	-4 106	-7.9		rate of exchange	-284.6	-11.5		rate of exchange	-67 659	-9.3	
CCA	-2.0	-2.4		CCA	-2.2	-10.7		CCA	-2.2	-5.0	
z+	41 887	3.8	2008					z-	-43 449	-2.2	2004
SLOVAK REPUBLIC				UKRAINE							
R Square	0.972			R Square	0.964						
Adjusted R Square	0.967			Adjusted R Square	0.956						
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>					
Intercept	74 697	6.3		Intercept	19 807	3.6					
t	4 152	18.5		t	8 547	9.7					
rate of exchange	-81 786	-6.6		rate of exchange	-5 775	-5.1					
				CCA	-3.0	-4.9					
z+	15 323	2.4	2008	z+	32 686	2.5	2008				

Source: as in Table 1.

We found, in all examined countries, negative response of GDP (measured in USD) to the foreign exchange depreciation. Nominal responses of GDP to the

changes of the CCA were slightly different (basically smaller but with higher  $t$  statistics) than the results we found solving basic linear function (7).

In Table 4 we present results of the estimates of equation (8) which illustrate the response of GDP to 1% change of the national currency (depreciation) and of 1 % change the CCA<sup>2</sup>.

**Table 4. GDP Relationships with CCA and Rate of Exchange**

Country	GDP % response to 1% average CAA decline	GDP % response to 1 % rate of exchange change
The Czech Republic	-3.29	-0.8
Hungary	-3.55	-0.6
Poland	-5.08	-0.7
The Slovak Republic	x	-1.3
Ukraine	-8.01	-0.4

Source: as in Table 1.

Slovakia is the most sensitive economy for changes of the exchange rate. All other V4 countries react with the same strength to depreciation or appreciation of their national currencies. The induced GDP change is measured as a ratio to the average of GDP, in the period 1994-2015. In the Czech Republic, Slovakia and Ukraine, just before the financial crisis hit that part of Europe, GDP was higher than average by around 30%. In Poland GDP was lower than average in 2004 by ca 14%. Ukraine sensitivity of GDP to the rate of exchange was smallest which can be attributed to big rate changes – average rate of exchange resulted was 6.1 UAH/USD and standard deviation is equal to 4.3.

In the Czech Republic and in Slovakia year 2008 was extraordinary successful, as GDP was higher than normal respectively by 29 and 11 billion USD. In Poland, unusual situation occurred in 2004 when GDP was lower by 33 billion USD. In Hungary GDP was lower by 8.6 billion in 2012 and in Ukraine in 2013 by 23.4 billion USD.

The statistically best results with respect to the shock analysis in terms of the determination coefficients were obtained for the years as shown in Table 5.

<sup>2</sup> NBP in their Working Paper No. 249 (Kapuściński et al. 2016) discussed an exchange rate channel as a factor determining growth of exports and imports. According to their findings the role of the rate of exchange is different in both cases and was subject to considerable changes. As concerns exports, in the pre-accession period the rate of exchange determined about 30% of export's volume growth; now it is only 8%; as concerns imports, the rate of exchange determines about 28% of import's volume growth. That is in line with our findings as the currency depreciation should grosso modo limit imports and enhance exports growth thus improving current account, especially when we analyse Polish economy in 20 years period.

**Table 5. Values of Determination Coefficients in Equations with and without Dummies and the Supposed Years of Shocks**

Equations	CZ	HU	PL	SK	UK
without dummy	0.93	0.97	0.96	0.96	0.94
with dummy	0.97	0.98	0.98	0.98	0.97
2007	1	1			
2008	1	1	1	1	
2009	1	1	1	1	
2010	1	1	1	1	1
2011	1	1	1	1	1
2012		1	1	1	1
2013		1	1	1	1
2014		1	1	1	1
2015					

Source: as in Table 1.

Based on the statistical analysis we obtained effects of the complex effects of financial crisis of 2008, debt crisis in EMU and the inflow of European funds into V4 economies (see Table 6).

**Table 6. Results of without and with Shock Dummies**

RESULTS WITH SHOCK DUMMIES				RESULTS WITHOUT SHOCK			
POLAND				POLAND			
R Square	0.994			R Square	0.988		
Adjusted R Square	0.992			Adjusted R Square	0.985		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	243 202	12.35		Intercepts	265 169	10.5	
t	20 755	28.69		t	22 830	35.31	
CCA	-1.9	-5.65		CCA	-2.2	-5.00	
rate of exchange	-57 141	-9.42		rate of exchange	-67 659	-9.29	
shock	41 159	3.84					
z-	-33 282	-2.21	2004	z-	-43 449	-2.18	2004
HUNGARY				HUNGARY			
R Square	0.996			R Square	0.988		
Adjusted R Square	0.995			Adjusted R Square	0.986		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	56 313	16.27		Intercept	62 503	12.06	
t	6 965	35.57		t	7 688	37.44	
CCA	-2.2	-16.76		CCA	-2.2	-10.68	
rate of exchange	-234	-12.68		rate of exchange	-284.6	-11.50	
shock	11 774	5.17					
z-	-8 619	-2.67	2012				

CZECH REPUBLIC				CZECH REPUBLIC			
R Square	0.992			R Square	0.981		
Adjusted R Square	0.990			Adjusted R Square	0.977		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	140 970	10.93		Intercept	155 466	8.07	
t	6 369	19.58		t	6 828	12.60	
rate of exchange	-3 387	-9.11		rate of exchange	-4 106	-7.93	
shock	27 190	5.99		CCA	-2.0	-2.43	
z+	29 359	3.84	2008	z+	41 887	3.76	2008
SLOVAKIA				SLOVAKIA			
R Square	0.992			R Square	0.972		
Adjusted R Square	0.990			Adjusted R Square	0.967		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	53 524	7.49		Intercept	74 697	6.32	
t	3 458	21.61		t	4 152	18.54	
rate of exchange	-54 196	-6.86		rate of exchange	-81 786	-6.60	
shock	17 043	6.65					
z+	10 988	3.07	2008	z+	15 323	2.36	2008
UKRAINE				UKRAINE			
R Square	0.986			R Square	0.964		
Adjusted R Square	0.981			Adjusted R Square	0.956		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	23 453	6.61		Intercept	19 807	3.64	
t	8 903	15.54		t	8 547	9.73	
CCA	-4.1	-10.09		CCA	-3.0	-4.95	
rate of exchange	-5 967	-8.15		rate of exchange	-5 775	-5.11	
shock	-18 637	-5.22					
z-	-23 414	-2.55	2013	z+	32 686	2.54	2008

Source: as in Table 1.

The insertion of shock dummies did not cause significant changes of the significance of the estimates for Poland, Slovakia and Ukraine. Remarkable conclusions one can draw on the GDP extraordinary levels recorded within indicated periods. In respective years of shock GDP was higher than “normal” in Poland by 41 \$billion, in the Slovak Republic by \$17 billion, in Hungary shock increased GDP by \$11.8 billion USD. In the Czech Republic shock increased GDP by \$27 billion, but weakened statistic significance of the current and capital account balance as an explanatory variable. All these findings indicate that V4 countries benefited during the crises years. Taking into account only shock coefficients and normalizing them to the 22 years average of GDP the estimated gain resulted to: ca 13% in Poland and Hungary, 20% in the Czech Republic and 31% in Slovakia. These are combined result of the adverse effects of the crises and the positive effects of the EU transfers. In Ukraine, which

did not benefit from the European transfers shocks lowered within respective periods GDP by \$18.6 billion.

In order to construct the impulse response functions we had to decide about VAR order. The number of lags (VAR order) we established using three information criteria (AIC, HQC, BIC) (Cottrell & Lucchetti 2016). They all indicated the same VAR order – one lag. We used it as the most appropriate also from an economic point of view. In our analysis of impulse response relationships between the chosen variables, we used the following ordering: GDP, CCA, rate of exchange (Cottrell and Lucchetti 2016).

The CCA changes caused GDP to fall in Poland and the Czech Republic in the first year (see Figure 1). In the second period GDP in Poland rebounds, in the Czech Republic GDP returns to previous level. In the Slovak Republic, the observed shock of GDP in the first period is in line with regression of equation (8), than GDP drops in the second year. The shock caused by the CCA change last longer in Slovakia than in the Czech Republic and Poland. In case of Hungary GDP's reaction is weak to compare with that we got from regression (8) and GDP reacts more strongly in the third period than within the first two. The changes of GDP due to the CCA shock persist the longest comparing with other economies.

The responses of GDP to the shock caused by the changes of the rate of exchange correspond to the results achieved from the regressions of equation (8) in all countries. In Poland, Hungary and the Czech Republic shock expires after two years. Negligible response we noticed in Slovakia.

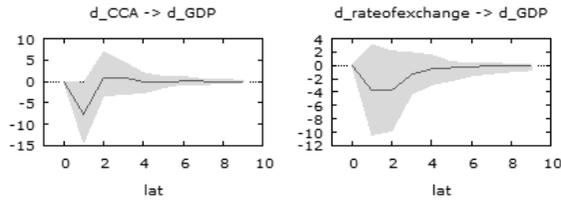
The results obtained for Ukraine (see Figure 2 and Figure 2a) require additional discussion. Firstly, we found very outlying rates of exchange in 2014 and 2015. Secondly, we have observed significant volatility of the CCA since 2008. These two facts could distort inference. Therefore we made two calculations, one for the shortened period (1994-2013) and one for the “normal” one (1994-2015). The shorter time series is stationary for one difference only. The longer one is reduced to stationarity by differencing three times.

In both cases the CCA shock causes GDP rise within the first period, subsequently it falls in the second year. The change of rate of exchange made GDP to descend. Using the longest and volatile time series we see much extended expiration period of both types of shocks accompanied by fluctuations of the response of GDP to the change of the variables.

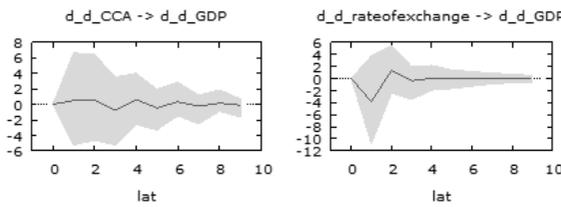
At the end we found relationships between the level of GDP and seven earlier listed components of the CCA in V4 and Ukraine (see Table 7).

**Figure 1. GDP responses to CCA and rate of exchange shocks “in 000 thousands”**

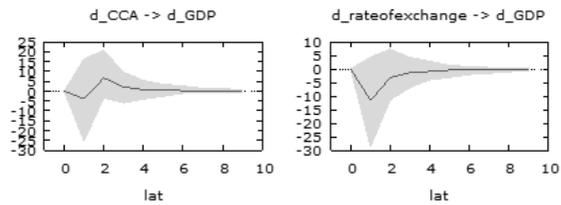
The Czech Republic



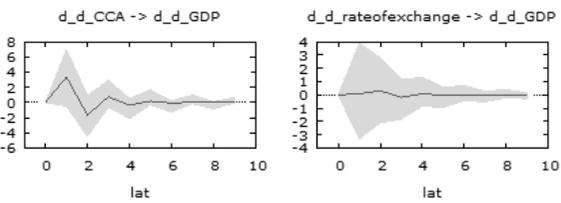
Hungary



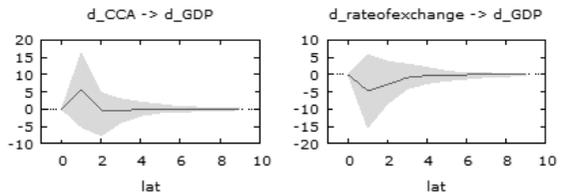
Poland



Slovakia



Ukraine



Source: the Authors' calculations; “lat” means years.

**Table 7. Results of the regression between components of the CCA and GDP**

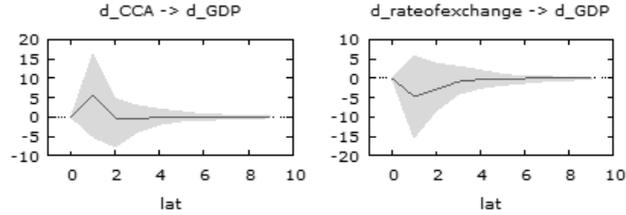
CZECH REPUBLIC				HUNGARY				POLAND			
R Square	0.991			R Square	0.991			R Square	0.997		
Adjusted R Square	0.989			Adjusted R Square	0.989			Adjusted R Square	0.997		
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>	
Intercept	11 826	1.97		Intercept	38 959	19.71		Intercept	74 181	20.43	
goods exports +	-2.7	-3.87		goods exports +	1.2	39.11		goods imports -	-2.1	-26.59	
goods imports -	-4.5	-5.90									
portfolio incomes +	14.1	3.31		services +	-4.0	-6.29		secondary incomes + transfers	3.7	2.56	
z+	34 097	4.64	2009	z-	-10 481	-2.34	2000	z+	40 014	4.32	2009
SLOVAK REPUBLIC				UKRAINE							
R Square	0.988			R Square	0.989						
Adjusted R Square	0.985			Adjusted R Square	0.987						
	<i>Coefficients</i>	<i>t Stat</i>			<i>Coefficients</i>	<i>t Stat</i>					
Intercept	6 475	3.68		Intercept	5815.9	2.25					
goods imports-	-1.3	-12.77		goods import -	-2.5	-23.7					
investment incomes +	2.9	1.94	2.4	other income +	10.1	3.84					
portfolio incomes +	10.1	1.92	2.2	capital accounts+	44.6	4.16					
z-	-12 116	-2.66	2006	z-	-15 886	-2.29	2011				
z+	16 217	3.55	2009								

Source: as in table 1.

Some estimated relations between GDP and variables are unexpected and difficult at this stage to explain. Estimated signs were different from expected in the case of the Czech Republic where we found the negative reaction of the level of GDP to the rise of exports. In Hungary we discover negative reaction of the Hungarian GDP to net export of services increase.

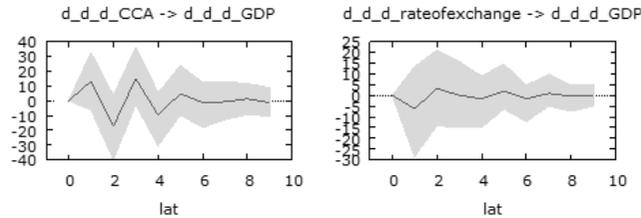
In table 8 we present GDP level's response (in %) to the changes of these CCA components that are statistically significant.

**Figure 2. GDP responses to CCA and the rate of exchange shocks in Ukraine “in 000 thousands” time series 1994-2013**



Source: as in Figure 1.

**Figure 2a. GDP responses to CCA and the rate of exchange shocks in Ukraine “in 000 thousands” time series 1994-2015**



Source: as in Figure 1.

**table 8. Changes caused by 1% increase of the statistically significant variables on GDP (in %)**

country	imports of good (-)	exports of goods (+)	services-balance (+)	secondary in-come and transfers (+)	invest-ments income (-)	portfolio income (+)	other income (-)	capital accounts (+)
Czech Republic	2.33%	-1.4%						
Hungary		0.71%	-0.12%					
Poland	0.70%			0.07%				
Slovak Republic	0.99%				0.12%	0.01%		
Ukraine	1.05%						0.14%	0.04%

(-) and (+) signifies if the time series is mostly positive or negative

Source: as in table 1

In Poland an increase of the secondary income and the current transfers by 1% (i.e. \$57.7 million) caused GDP growth by \$213 million. In Slovakia the reduction of 1% of investment income (reduction debit of about \$23 million) increased of level of GDP (on average) by 0.12% i.e. \$65 million. In Ukraine

reduction of the interest paid on foreign credit by 1% (\$13 million) increased GDP by \$12.8 million.

It turns out that the connections between non-trade components of the CCA and GDP in all analysed countries as compared with the foreign trade results are relatively weak. It could possibly result from length of the period of analysis with the shorter period of European transfers than that of current account deficit. In the Czech Republic and in Poland current and capital account was in deficit in 19 years, in Slovakia within 16 years, in Ukraine in 15 years and in Hungary in 15 years. There is however one common feature of GDP response to foreign trade components. It is responsiveness of GDP to the changes of imports level. In all cases, except Hungary, within 22 years, on average, a decrease of imports reduced substantially the level of GDP. The strongest influence of import's reduction on GDP was observed in the Czech Republic, the weakest in Poland. This should be seen bearing in mind differences in the importance of imports in GDP. The average, in 22 years, share of imports in GDP (in local currencies) amounted in the Czech Republic 55%, 65% in Hungary, 72% in Slovakia and 34% in Poland. It is remarkable the only in Hungary exports of goods is statistically significant with the level of GDP. The average share of exports in GDP in Hungary (63% – now 91%) was even lower than in Slovakia (69% – now 93%) and only by 7 percent points higher than in the Czech Republic (in Poland average share amounted 33% - now it is 53%).

## Conclusions

We assume that in the medium size open economy, GDP growth is positively correlated with the inflow of foreign capital. Assuming also that growth rates of GDP in the long run are demand constrained we deem that one of the most important constraints is the external equilibrium. We suppose also that external equilibrium exist as long as a country's net borrowing needs are financed at the market conditions by net foreign capital inflows. Therefore the foreign financial sustainability is endangered by the adverse dynamics of the current and capital account in comparison with the dynamics of the country's GDP growth. Continuous trade deficits, even if temporarily financed by different external investments could lead to a debt trap and financial crisis. In other words when foreign debt becomes unsustainable, country is losing its external equilibrium, different foreign investments are curtailed, domestic expenditures are reduced and GDP declines. It is therefore important to estimate the long term relationships between the current and capital account, its components as well as the rate of exchange and the level of GDP.

Nearly in all V4 countries and Ukraine (except Slovakia) we found negative relationships between the current and capital balance and the level of GDP. The rate of exchanges was in all cases negatively correlated with the respective GDP. It means that improvement of the external financial stability accomplished by reducing current account lowered the level of GDP in these economies. Almost in all analysed countries (except Hungary) GDP was also negatively correlated with the imports level which shows dependence of these economies on their relations with trade partners – the greatest dependency was detected in the Czech Republic the lowest in Poland. Hungary was an exemption as it shows a positive correlation between exports and GDP and a negative relationship between balance of services and GDP. The statistically significant relations between non-trade components of the CCA and GDP in all analysed countries were relatively weak. It confirms still bigger role in these economies of the nominal trade flows than capital movements. The regression between GDP and the current and capital account and rate of foreign exchange using shock dummies did not significantly change results. It illustrates, however how combined effects of financial crisis, euro zone problems and UE transfers generate GDP level divergence from the average for the analysed period.

## Bibliography

- Barnett W. et al. (2015), *Bifurcation of Macroeconometric Models and Robustness of Dynamical Inferences*, “Foundations and Trends in Econometrics”, Vol. 8, No. 1–2.
- Benczes I. (2014), *Critical Junctures and Unintended Consequences: The Case of Hungary*, (in:) *Deficit and Debt in Transition: The Political Economy of Public Finances in Central and Eastern Europe*, Central European University Press, Budapest–New York.
- Bennardo A. et al. (2014), *Multiple Bank Lending, Creditor Rights, and Information Sharing*, “Review of Finance, Oxford Journal”.
- Błaszczuk D.J. (2001), *Ryzyko kryzysu finansowego w Polsce*, Wyższa Szkoła Ubezpieczeń i Bankowości w Warszawie, Warszawa.
- Borio C., Disyatat P. (2015), *Capital flows and the current account: Taking financing (more) seriously*, BIS.
- Catão L., Milesi-Ferretti G.-M. (2013), *External Liabilities and Crises*, IMF, Washington.
- Cottrell A., Lucchetti R. (2016), *Gretl User’s Guide*, Gnu Regression, Econometrics and Time-series Library.
- De Gregorio J. (2014), *Capital flows and Capital Account Management*, (in:) *What Have We Learned*, IMF and MIT, Washington.
- Edwards S. (2002), *Does the Current Account Matter?*, University of Chicago Press, Chicago, London.
- EU (2017), *Official Journal of the European Union*, <http://eur-lex.europa.eu/homepage.html> [access: 15.01.2017].

- Forbes K., Warnock F. (2011), *Capital Flow Waves: Surges, Stops, Flight and Retrenchment*, NBER, Cambridge, MA.
- Forbes K. et al. (2016), *Current Account Deficits During Heightened Risk: Menacing or Mitigating?*, NBER, Cambridge, MA.
- Granger C. (2001), *Essays in Econometrics: Volume II; Causality, Integration and Cointegration, and Long Memory*, Cambridge University Press, Cambridge.
- IMF (2014a), *2014 Pilot External Sector Report*, IMF, Washington.
- IMF (2014b), *2014 EBA: Individual Country Estimates*, IMF, Washington.
- IMF (2009), *Balance of Payments and International Investment Position*, IMF, Washington.
- IMF (2016), *IMF Data. Access to Macroeconomic and Financial Data*, <http://data.imf.org/regular.aspx?key=60947517> [access: 15.01.2017].
- Kapuściński M. et al. (2016), *Monetary policy transmission mechanism in Poland. What do we know in 2015*, NBP, Warsaw.
- Korotayev A., Tsirel, S. (2010), *A Spectral Analysis of World GDP Dynamica: Kondratieff Waves, Kuznets Swings, Juglar and Kitchin Cycles in Global Economic Development, and the 2008–2009 Economic Crisis*, “Structure and Dynamics”, No. 1, Vol. 4.
- Liebowitz S., Margolis S. (1995), *Path Dependence, Lock-In, and History*, “Journal of Law Economics and Organization”, February.
- Lucas R. (1990), *Why doesn't Capital Flow from Rich to Poor Countries?*, “The American Economic Review”, No. 80(2).
- MFW (2013), *External Balance Assessment (EBA) Methodology: Technical Background*, IMF Research Department, Washington.
- Obstfeld M. (2012), *Does the current account still matter?*, NBER, Cambridge, MA.
- Obstfeld M. et al. (2008), *Financial Stability, the Trilemma and International Reserves*, NBER, Cambridge, MA.
- Obstfeld M. (2012a), *Financial Flows, Financial Crises, and Global Imbalances*, “Journal of International Money and Finance”, Vol. 31.
- OECD (2016), [http://stats.oecd.org/index.aspx?r=186043&errorCode=403&lastaction=login\\_submit#](http://stats.oecd.org/index.aspx?r=186043&errorCode=403&lastaction=login_submit#) [access: 15.01.2017].
- Piketty T. (2014), *Capital in the Twenty-first century*, The Belknap Press of Harvard University Press Cambridge, MA.
- Rajan R. (2016), *Going Bust for Growth*, (in:) *Progress and Confusion*, MIT Press, Cambridge, MA.
- Sawicki J. (2016), *Znaczenie obrotów bieżących i kapitałowych dla stabilności finansów zagranicznych. Przykład krajów grupy Wyszehradzkiej, „Unia Europejska”*, nr 6.
- Taleb N. (2010), *The Black Swan*, Penguin Books Ltd, London.
- Verdier D. (2002), *Moving Money: Banking and Finance in the Industrialized World*, Cambridge University Press, Cambridge.

# Ekonometryczna analiza zewnętrznej stabilności finansowej krajów Grupy Wyszehradzkiej i Ukrainy

## Streszczenie

W artykule dokonano analizy zależności między saldem rachunku bieżącego i kapitałowego (ang. CCA), jego części składowych i kursem wymiany, z jednej strony, a PKB, z drugiej, w krajach Grupy Wyszehradzkiej (V4) i Ukrainy na podstawie danych rocznych w okresie lat 1994-2015. Szczegółowo omówiono założenia, metodę analizy i wyniki naszego badania tych zależności. We wszystkich krajach V4 (z wyjątkiem Słowacji) i na Ukrainie stwierdzono negatywne zależności między zmianami na rachunku bieżącym i kapitałowym a PKB. We wszystkich krajach deprecjacja kursu wymiany na ogół powodowała obniżenie się poziomu PKB. Stwierdzono również silną długookresową zależność poziomu ich PKB od handlu zagranicznego, pomimo rosnącego rozwoju finansów, zwłaszcza po 2004 roku. Z drugiej strony, okazało się, że zależności między kapitałowymi składnikami CCA a PKB we wszystkich analizowanych krajach są stosunkowo słabe. Siła i kierunek oddziaływania analizowanych zmiennych na PKB mogą wskazywać na systemową słabość, jeżeli chodzi o stabilność zagranicznych systemów finansowych, oraz na inherentne ryzyka towarzyszące nagłym zmianom w najbardziej wrażliwych częściach rachunku bieżącego i kapitałowego.

**Słowa kluczowe:** bilans płatniczy, saldo rachunku bieżącego i kapitałowego, wskaźnik relacji części składowych salda rachunku bieżącego i kapitałowego do PKB, zewnętrzna stabilność finansowa, kraje Grupy Wyszehradzkiej, Ukraina.

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