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ECONOMETRIC ANALYSIS OF THE RELATIONSHIPS BETWEEN GDP AND THE CURRENT AND CAPITAL ACCOUNT FOR THE VISEGRAD GROUP OF COUNTRIES IN 1994-2015

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In the paper the relationships between current and capital account balance and GDP are analysed, both from the economic analysis and applied points of view. Next the assumptions, method of analysis and results of our investigation of these relationships are discussed in details. We used yearly data for the Visegrad Group countries in 1994-2015. We applied two versions of linear econometric models and a power one for panel data and for every country separately.

Keywords: balance of payments, current and capital account, external financial stability, the Visegrad Group countries

1. Introduction

Since 1990, the economies of the former European centrally planned economies (some of them are referred to as emerging economies) have started process of "catching-up" with advanced economies. This process required external net capital inflow, which is equal to the difference between inflows and outflows of foreign capital to the country. This difference in the given year is recorded on the current and capital account (CCA) of the balance of payments of the country concerned.

These emerging economies have become net recipients of foreign capital, particularly in the period just before and after their accession to the European

Union, when net EU transfers had become extremely important. As of present, possible constraints of capital flows into these countries and subsequent reversal of direction of the net capital flows can have a significant negative impact on their future GDP growth rates.

Therefore, in the paper we analyse empirical relationships between GDP and the CCA balance. We examine these relationships for the Visehrad Group countries (V4). These countries entered the EU at the same time in 2004. In addition, the Czech Republic, Slovakia and Hungary are the main Poland's economic partners among the Central European countries. In this study we use annual data for the longest possible period: from 1994 to 2015.

The analysis of the results and, in particular, similarities and differences for different countries on the basis of panel data estimations will indicate, among others for the macroeconomic politicians of these countries, current and potential risks to financial stability of the individual economies.

2. Selected recent empirical studies

Analysis of the foreign assets and liabilities covers causes and effects of imbalances on the current and capital balance of the payments account. Initially, foreign assets and liabilities were associated with the flows of goods only. Later on services and recently also capital flows have also become subjects of the CCA analyses [36].

The relationships between the CCA balance and GDP were topic of a number of recent empirical analyses. Edwards [10] analysed these relationships and stated that the CCA balance changes are only indirectly dependent upon the level of GDP (through the level of investments) while substantial positive changes of the CCA balance have negative influence on GDP. Moreover, he proved that the CCA balance changes are correlated with the economic crisis.

In connection with the growing imbalances of the CCAs in the United States, Gruber and Kamin [13] made in 2005 a panel regression of the CCA-to-GDP ratio for 61 countries from 1982 to 2003.Their studies confirmed the strong link between the crisis and the CCA balance and explained also growing imbalances in the global financial market. In 2010, Jordà, Schularick and Taylor [21] stated that increasing negative ratio of the CCA-to-GDP was an important factor of financial crisis, though with a much smaller effect as compared to the credit-to-GDP ratio. The different approach presented by Bagnai [5; 6] confirmed statistically relevant positive relationship between the CCA-to-GDP ratio and the State-Budget-deficit-to-GDP. In 2011 Frankel and Saravelos [11] found out that the CCA balance had no significant effect on GDP, while the impact of external debt on the level of GDP turned out to be statistically significant.

There are also dynamic balance-of-payments analyses within the framework of intertemporal theories [12]. These theories combine the absorption approaches [20] and elasticity ones [26, Ch. 10 and 13] and take into account the macro-economic forecasts of relative price changes and their impact on future (stochastic) changes in savings and investments. In the intertemporal approach to the balance of payments it is assumed that the level of net foreign liabilities accumulation is limited in time by the terms of their repayment.

3. Relationships between GDP and CCA balance in current economic realities

Discussions on the importance of foreign imbalances have been renewed since numerous financial crises in the 1990s [28]. Then the Summers thesis that the balance of payments should not be a cause of the crisis of payments, if the public national finances are balanced, has also been called into question [9]. Therefore ability of the country to honour its foreign commitments became the basis for the external evaluation of financial stability of the economy.

A lot of empirical investigations have been done by the IMF staff [e. g. 32; 1; 2; 27] and EU analysts [25] after the outbreak of the financial crisis in 2008 and then of the sovereign debt crisis in the Economic and Monetary Union (EMU) in 2010. In particular, attempts were made to determine the proper, from the point of view of financial stability, level of the CCA-to-GDP ratio. Exceeding this level implies a "bad" equilibrium in the sense of Blanchard [7; 24]. The dominant indicator of the short term external equilibrium has become the ratio of current account (CA) to GDP. Currently the average of this relation over a period of the three consecutive years is used by the European Commission [33, art. 3 & 4] with the threshold of - 4% for the deficit economies and +6% for the economies with surplus on their current account. European Commission constructed likewise a set of indicators named *Alert Mechanism Report* (AMR) [3]. This set, along with the levels of reference [33, art. 3 & 4] is important in the assessment of the financial stability of the country [15]. On this basis, the European Commission elaborates *In-Depth Reviews* (IDRs) for countries for which the indicators show the risk of loss of financial stability. The European Central Bank (ECB) joined these analyses indicating, among others, that not net but gross assets and liabilities position characterizes the potential currency and time mismatches risk [14].

Also the IMF has carried a number of empirical studies having practical implications. They analysed conditions for the stable CCA-to-GDP ratio and estimated as function of the structural variables, actual values of economic policy variables and the differences between actual values of economic policy variables and the expected ones [27]. In order to keep at the steady state net foreign commitments to GDP, the GDP growth rate in every future period $t = 1, ..., n$, should be at least equal to the growth rate of net liabilities to non-residents.

Therefore, one needs to determine under what conditions the CCA growth rate would not be greater than the GDP growth rate. That requires ability to manage variables influencing this ratio.

4. Subject, assumptions, method of analysis and sources of statistical data

We assumed, first, that we shall investigate the relationships between GDP and the CAA balance for the V4 basing on panel data and separately for each country. Second, in order to receive comparable results we have decided to use annual data at current prices in USD available in the OECD and the IMF statistical sources [16, 17, 18, 19]. Third, we have chosen period 1994-2015, with, more or less, the last two Juglar business cycles included (data on the balance of payments before 1994 are not published by the IMF). Thanks to that the results obtained are not random but rather reflect long-term relationships. Fourth, in order to eliminate the impact on the results of changes in USD exchange rates against national currencies, we have included the average annual values of the respective exchange rates (φ_{jt}). Fifth, we took into account two important events that had occurred in the analysed period: the biggest, since the Great Depression years of 1929 to 1933, world economic and financial crisis 2007-2008 and the subsequent debt crisis in the EMU countries. The effects of these shocks in the V4 were observed in years 2008-2015. In the same period these countries have benefited from the European Union aid programmes. Unfortunately, one cannot split the effects of these two events. Nevertheless we used dummy variable (**DV**) for years 2008-2015.

Estimates were made on non-stationary data because of relatively short time series and due to the fact that for various countries stationary data we obtained for the differentiated series. In such a situation, it would be difficult to compare the estimates of corresponding structural parameters for different countries. Therefore, to eliminate the impact of trends on the values of GDP, we have used a time variable **t**.

Next we have assumed that the dependency of GDP on the CCA balance can be expressed by linear functions as well as by power ones. Due to the fact that there were both positive and negative values of the CCA balances, we have used the CCA as well as the CCA+ and the CCA− (positive values were assigned to the last two variables).

Basing on of the above assumptions, we estimated two x five linear functions:

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

and

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

and five power ones:

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

where:
j = 1, 2, 3, 4, 5 – panel, Czech Republic, Hungary, Poland, Slovak Republic;
t = 1, 2, …, 22 – 1994, 1995, …, 2015.

We assumed that each of the 15 equations can be estimated by the OLS method, taking into account that equations (1a) and (1b), and after appropriate transformations also (2), are linear ones. Estimates were made with the help of the Excel spreadsheet [8]. Identified errors in this sheet do not apply to, as it seems, x our calculations [31].

In addition, already at verification of the different equations, we removed (one by one) the most insignificant statistically variables. On the last stage we used two dummy variables to take into account unusual situations: 1a): β^{l}_{5j} * $\mathbf{Z}^{-}_{t}$ + β^{l}_{6j} * $\mathbf{Z}^{+}_{t}$; 1b): β^{l+}_{5j} * $\mathbf{Z}^{-}_{t}$ + β^{l+}_{6j} * $\mathbf{Z}^{+}_{t}$ and 2: $\mathbf{Z}^{-}_{t}$^ β^{p}_{5j} * $\mathbf{Z}^{+}_{t}$^ β^{p}_{6j}, respectively, where:
Z– = 1 for standardised residuals < –2 and 0 elsewhere and Z+ = 1 for standardised residuals > 2 and 0 elsewhere.

6. Discussion of results

In statistical terms the results of the survey are surprisingly accurate. The values of the adjusted coefficients of determination in all 15 models are well above 0.95 (cf. rows 14 in Table 1, and 15 in Tables 2 and 3). At the same time, the values of the panel version of the Durbin-Watson statistics (DW) are located either between dU and 4 – dU or in close proximity to the lower end of this interval.

Further on, we present interpretation of the estimates of these structural parameters that are both statistically (t-stat >2.0) and economically relevant. By the interpretation of the estimates, a special attention should be given to the "scaling" factor in relation to the level of GDP and also to the expression: "*ceteris paribus*" (remaining unchanged) that occurs in each and every case.

6.1. Linear models

The estimates of the constant in linear panel models confirm the expectation that in the analysed period, *ceteris paribus*, the values of GDP in the Czech Republic and Hungary were similar to the average value, while the Poland's GDP was higher by about $140 billion, and Slovakia's smaller by a little more than $60 billion (cf. rows 2-5, column 3 in Table 1 and Table 2). These values show the diversity of the potentials of these economies.

According to both panel models and linear ones, there was a significant positive relationship between GDP and the time trend (cf. rows 6 in Table 1 and

Table 2). On average, in the analysed countries, GDP increased each year, *ceteris paribus*, by $7.5 billion. Similar value was for Hungary and only somewhat smaller for the Czech Republic. In Poland, which as the only country remained a "Green Island" during the recent crisis of 2008-2009, increase in GDP was slightly more than 2.5 times larger than the average one, and in Slovakia, which has suffered the most during this crisis it was equal to about 1/3 of the average. The estimated annual increases are equal to: 4.5%, 7.4%, 6.0% and 4.8% of the GDP of the respective countries (in the order of their English names).

The CCA balances according to models (1a) in all countries were inversely correlated with GDP (cf. row 7 in Table 1). These results are consistent with theory and other research studies. In the Czech Republic and Hungary, reduction of negative or increase of positive balance by $1 billion, *ceteris paribus*, caused, on average, a decrease of GDP of about $2.6 billion, in Poland about $2.2 billion, and in Slovakia below the $1 billion (43%, 37%, 11% and 35% of annual increases in GDP, respectively, as measured by the values of the estimates standing by the variable **t**. The scale of the impact of the CCA changes on GDP corresponds to the importance of foreign trade to GDP for these countries.

Table 1. Estimations results of Model (1a)

Description		**Panel**		**CZ**		**HU**		**PL**		**SK**	
1	b_i / t Stat	b_i	t Stat		t Stat	b_i	t Stat	b_i	t Stat	b_i	t Stat
2	**CZ**			**146.7**	7.96						
3	**HU**					**58.5**	12.23				
4	**PL**	**141.2**	12.51					**252.0**	11.77		
5	**SK**	**-62.9**	-6.60							**56.2**	8.34
6	**t**	**7.5**	8.99	**6.1**	9.66	**7.0**	22.97	**19.3**	18.20	**2.6**	12.04
7	**CCA**	**-7.3**	-10.28	**-2.6**	-3.18	**-2.6**	-11.30	**-2.2**	-6.19	**-0.9**	-3.08
8	**φ**	**-0.1**	-2.23	**-3.7**	-7.23	**-0.3**	-10.21	**-58.2**	-8.70	**-52.7**	-7.04
9	**DV**	**53.8**	4.07	**18.0**	1.94	**11.8**	2.58	**55.2**	3.86	**29.5**	8.81
10	**Z-**	**-102.2**	-3.95								
11		PL: 1999; 2000									
12	**Z+**	**204.6**	8.27	**35.6**	3.28					**19.4**	5.17
13		PL: 2013 - 2015		CZ: 2008						SK: 2007	
14	R^2 / R^2_{sk}	0.974	0.959	0.985	0.980	0.992	0.990	0.992	0.990	0.994	0.992

Source: Authors' calculations based on data published by IMF and OECD

In view of the abovementioned results, the relationship between the CCA and GDP in the panel model does not look reliable (approximately 3 times higher than in the first three countries and more than 8 times higher than in Slovakia). The reason for this is most likely a significant value in the panel model of estimate standing by the dummy variable **Z+** (it will be discussed later on).

Breakdown of data on the CCA balance into two variables corresponding to their positive and negative values allowed for deriving additional conclusions. First of all, there were very similar periods in which these balances were negative: Czech Republic (1994–2012); Poland (1996–2012); Slovakia (1996-2011);

Hungary (1994-2008). Positive balances for Poland, Slovakia and the Czech - Republic have been recorded after the outbreak of the debt crisis in the EMU, while in Hungary the financial crisis caused a decline in the deficit. In all the V4 the restrictive financial policy led to reduction of the budget deficit improved the CCA balance.

Second, the algebraic signs of all the respective estimates are in line with expectations (cf. rows 7 and 8 in Table 2).

In the Czech Republic and Hungary, the improvement of balance resulted in similar reductions in nominal GDP (ca. $6.0-7.0 billion and $4.0 billion, i.e. 5.0% and 4.2% of the GDP, respectively). In addition, in the case of the Czech Republic the positive CCA is the only statistically significant variable and relevant estimate is about 2.5 times higher than in the Model (1a). This result should be approached with caution due to the fact that there were only 3 (in 2013-2015) out of 22 positive the CCA balances. Nevertheless, basing on estimate of the corresponding slope coefficient in the period 2012-2015 equal to 3.83 (GDP decreased by almost $25 billion, and the CCA balance improved by nearly $6.5 billion), one can conclude that the relationship is only slightly overestimated, if ever.

Table 2. Estimation results of Model (1b)

Description		**Panel**		**CZ1**		**CZ2**		**HU**		**PL**		**SK**	
1	b_i / t Stat	b_i	t Stat	b_i	t Stat	b_i	t Stat	b_i	t Stat	b_i	t Stat	b_i	t Stat
2	**CZ**			**157.4**	7.39	**150.4**	8.79						
3	**HU**							**58.9**	14.85				
4	**PL**	**136.6**	10.48							**238.2**	9.86		
5	**SK**	**-64.6**	-6.14									**52.7**	7.98
6	**t**	**7.5**	7.96	**6.4**	8.08	**7.4**	13.62	**7.6**	20.95	**19.2**	16.40	**2.4**	11.67
7	**CCA-**	**-8.4**	-8.41					**-1.8**	-4.43	**-2.7**	-5.39	**-1.5**	-3.67
8	**CCA+**			**-7.5**	-3.34	**-6.1**	-3.48	**-4.0**	-7.55				
9	**φ**	**-0.2**	-3.39	**-3.9**	-6.35	**-3.9**	-8.24	**-0.3**	-12.43	**-55.5**	-7.47	**-49.0**	-6.72
10	**DV**	**44.8**	3.10	**20.2**	2.04			**8.9**	2.16	**53.0**	3.39	**30.8**	9.58
11	**Z-**	**-109.4**	-3.83										
12		PL: 1999; 2000											
13	**Z+**	**200.2**	6.54			**39.8**	4.02	**13.3**	3.08			**20.0**	5.72
14		PL: 2013; 2014				CZ: 2008		HU: 2013				SK: 2007	
15	R^2 / R^2_{sk}	0.968	0.953	0.977	0.972	0.985	0.982	0.995	0.993	0.990	0.988	0.995	0.993

Source: Authors' calculations based on data published by IMF and OECD

In the case of Hungary the negative CCA balance is also statistically significant. Increase of its absolute value by $1 billion resulted in, on average, *ceteris paribus*, GDP growth by a little less than $2 billion (1.9% of the average GDP in the analysed period). It is only little (about $0.8 billion) less than according to the Model (1a). Both estimates reflecting the relationship between the CCA balance and GDP in Hungary in the model (1b) are highly reliable - their weighted average is equal to the relevant result for this country in the Model (1a).

In turn, in the case of Poland and Slovakia statistically relevant are the negative CCA balances only, and the estimates are about 1.5 times higher, than in the Model (1a). In this case, one of the reasons is, without a doubt, taking into consideration only 5 and 6, respectively, out of 22 observations. In addition, determinants of different reactions of GDP to the increase of negative and positive CCA balances are widely discussed in literature [10, 13, 11, 27].

The USD exchange rates in national currencies were also negatively correlated with the GDP (cf. rows 8 in Table 1 and 9 in Table 2), but there are wide differences between the respective values for the individual countries. These differences are much less important after their scaling relative to the average exchange rates. On average, the increase in the USD exchange rate by: 1 grosz (0.33%) caused, *ceteris paribus*, reduction of the Poland's GDP by nearly $550-582 million; one eurocent (1,19%) - the Slovakia's GDP by about $490-545 million; 10 halers (0.39%) - the Czech Republic's GDP by about $370-390 million; 1 forint (0,48%) - a decline in Hungary's GDP by about $300 million. So, a 1% change of the USD exchange rate in national currencies, resulted, on average, *ceteris paribus*, in changes of GDP in the Czech Republic by $0.41-0.42 billion, in Hungary by $0.63 billion, in Poland by $1.81−1.91 billion and in Slovakia by $0.37–0.40 billion.

According to the both linear models the estimates standing by **DV** are positive (cf. rows 9 in Table 1 and 10 in Table 2). This shows that the examined countries benefited, *ceteris paribus*, on the balance of economic crisis and its consequences on the one hand, and EU financing on the other: Hungary in the amount of approximately $10 billion (7.5% of GDP in 2008), Czech Republic about $20 billion (7.7%), Poland up to 55 billion USD (10.0%), and Slovakia about $30 billion (30.6%). These values, *ceteris paribus*, testify the importance of the impact of external economic factors (before 2008 and from 2008 to 2015) on the relationships between the CCA balances and GDP for the surveyed countries.

In addition, in three Models (1a) and in four (1b) ones there are dummy variables (***Z-*** and/or ***Z+***) reflecting, *ceteris paribus*, specific situations (cf. rows 10-13 in Table 1 and 11-14 in Table 2). Unusual situations according to the both models have occurred: in Slovakia in 2007, in the Czech Republic in 2008 and in Poland in the years 1999-2000 and 2013-2014, as well as in 2015 (according to Model (1a)) and in Hungary in 2013 (according to Model (1b)). In the case of Slovakia in 2007, the inflation rate decreased from 4.5% to 2.8% and nominal GDP grow-th in national currency increased from 8% to 10.6%. At the same time, GDP measured in USD increased by almost $25 billion (more than 21% over the previous year). This was the result of, among other things, 17% appreciation of the Slovak koruna against the USD. In addition, there was an inflow of cross-border capital in 2008. In the Czech Republic there were capital inflows and the appreciation of the Czech koruna at 13%. The result was a one-time increase in GDP of about $35-40 billion (16% of the GDP of the country in the relevant year

and 25% y/y). But at the same time, **DV** became statistically insignificant. Related to this was the fact that after 2008, the average level of GDP in the Czech Republic was 16% lower than GDP in 2008. Hence, the Czech Republic benefited from EU financing in 2008-2015 only in 2008; while in subsequent years this financing was "cancelled out" by the negative effects of the crisis and its consequences until at least 2015. In turn, the rapid growth of Hungarian net exports to $10 billion in 2013 as a result, *inter alia*, of the depreciation of the forint in respect to the USD by 25% caused (according to Model (1b)), one-time sharp increase in GDP equal to $13 billion (9.6% of the GDP in the relevant year). By contrast, in Poland the unusual situations were only in relation to the other three countries. In 1999-2000, GDP was decreased by more than $100 billion USD (29% against its average theoretical level in 1999-2000) as a result of the so-called cooling down of the business cycle. On the other hand, in 2013-2015 there was an average increase of GDP just over 200 billion (13% of its average theoretical GDP level over the 2013-2015 period). This was due to the acceleration of investments financed from EU funds.

Summing up, we detected strong linear relations between the GDP and the time trend, the CCA balance, the USD exchange rate, the business cycle and inflows of EU funds in all V4 in 1994-2015. These results, although quite heterogeneous throughout the analysed countries, are consistent with the economic theory.

6.2. Power models

Estimates of all the constants and structural parameters as implied by the variable **t** are statistically very significant (see columns 2, 4, 6, 8, 10, 12 and 14 in rows 2-6 in Table 3). Their values have no straightforward economic interpretation.

Both economically and statistically relevant are only the estimates for the negative CCA balance in the panel model and both models for Hungary. Reduction by 1% of the CCA deficit in the countries in question in the analysed years, *ceteris paribus*, resulted in, on average, reduction of GDP in these countries in those years by about 0.05% (from 0.035% to 0.075% in Hungary). In addition, statistically relevant are estimators standing by the positive CCA balances in models for Hungary, Poland and (almost) the Czech Republic. Their absolute values are similar to those discussed above (0.06 in case of Hungary and 0.038 and 0.033 for the Czech Republic and Poland, respectively) but their algebraic signs are inconsistent with theory. The causes of such results can be: a very small number of observations and, perhaps, inappropriate estimation method. However, the introduction of ***Z+*** in the models for the Czech Republic and Hungary resulted in a significant decrease in statistical significance of the CCA+. To sum up, according to the power models, statistically and economically significant influence on the GDP had a negative CCA balance in Hungary and in the panel. None of the two variables describing the CCA balance had significant statistically and economically impact on GDP in the Czech Republic and Slovakia while in Poland the positive

CCA balance had relevant statistically but irrelevant economically impact on the GDP.

In line with expectations and statistically very significant are all the estimates standing by the exchange rates. At the same time we see clearly their similarity in countries that have not the common currency (cf. row *9* in *T*able 3). The growth of USD of exchange rate by 1%, *ceteris paribus*, resulted, on average, in a decline in GDP of the Czech Republic by almost 1.3%, Poland - by slightly over 1%, and Hungary - by about 1.2%. Clearly higher was the exchange rate elasticity of GDP in Slovakia (1.9%). This is due to the Mundell-Fleming trilemma [29; 37]. The member country of the EMU has no independence in shaping the exchange rate and with the free movement of capital has no freedom in shaping its monetary policy. The relevant estimate in panel model (-0.8) is difficult to the economic interpretation because of diversity of levels of the USD exchange rates in national currencies.

DV is statistically significant in three power models: panel and for Poland and Slovakia. In Poland, the GDP in the period 2008-2015, *ceteris paribus*, was higher than the respective theoretical values, on average, $e^{0,1524} = 1.16$ times, and in Slovakia: $e^{0,2453} = 1.28$ times (higher by 16% and 28%, respectively). These results correspond largely to the results obtained on the basis of both linear models (10.0% and 30.6%, respectively). However the result for the entire analysed group: $e^{0,2825} = 1.33$ times (higher by 33%) seems incredibly high. In addition, *ceteris paribus*, Slovakia's GDP in 1994 and 2007 was higher than the corresponding theoretical values by 64% ($e^{0.4939} = 1.64$) and 48% ($e^{0.3895} = 1.48$), respectively and in 1999 and 2001 was lower, on average, by 28% ($e^{-0.3243} = 0.72$). Problem Y2K and events related to the crisis of the dot-com boom may be the justification of the decline. On the other hand beginning of the adjustment of the economy for membership in the EMU could result in 2007 increase. In turn, GDP of the Czech Republic in 1994 was higher than the respective theoretical value (basing on panel model) by 48% ($e^{0.3895} = 1.48$) and, on average, in 1994 and 2015 was higher (on the basis of the model for this country) by 12% ($e^{0.1097} = 1.35$). In addition, the Hungary's GDP in 1994 was larger than the corresponding theoretical value by 35% (e 0.3025 = 1.35). Interesting that in all the models the unusual results have been recorded for the first year of the survey (1994).

7. Conclusions and final remarks

Relations between GDP and the CAA balance have been examined from the time of Hume. Recently they have become of particular interest in connection with the financial crisis of the 90. of the last century. Currently they are of even greater concern of politicians (governments) and practitioners (investment banks, etc.) because of threats of the crises related to the external imbalances of economies.

Also economic analysts have carried out a large number of empirical studies of these relationships. Results of these studies, in general, confirm the existence of negative relation between the CCA balance and GDP.

The results of our investigations for V4 in 1994-2015 are more or less in line with them. Nevertheless further investigations of these relationships are required. In particular, dependencies between the CCA balance and GDP in terms of VAR models as well as between the components of the CCA balance and GDP should be analysed with the help of both linear models and nonlinear ones.

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Table 3. Estimation results of Model (2)

Description		Panel		CZ1		CZ2		HU1		HU2		PL		SK	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	b_j / t Stat	b_j	t Stat	b_j	t Stat	b_j	t Stat	b_j	t Stat	b_j	t Stat	b_j	t Stat	b_j	t Stat
2	**CZ**	**6.1239**	26.6	**8.1130**	52.59	**7.9984**	76.53								
3	**HU**	**7.5411**	19.7					**9.2030**	28.18	**8.7137**	42.15				
4	**PL**	**5.2965**	56.6									**5.4698**	96.99		
5	**SK**	**2.3979**	42.8											**1.9483**	23.74
6	**ln t**	**0.5073**	20.0	**0.3609**	26.29	**0.3827**	42.70	**0.7307**	29.09	**0.7923**	65.53	**0.6004**	34.22	**0.6230**	16.19
7	**ln RBK$^-$**	**0.0480**	2.9					**0.0738**	3.34	**0.0352**	4.26				
8	**ln RBK$^+$**			**0.0374**	1.84			**0.0595**	2.21			**0.0330**	2.69		
9	**ln φ**	**–0.8203**	–11.2	**–1.2901**	–30.76	**–1.2706**	–44.88	**–1.2164**	–18.31	**–1.1397**	–27.96	**–1.0403**	–18.39	**–1.9026**	–12.42
10	**ZS**	**0.2825**	6.3									**0.1524**	5.19	**0.2453**	4.18
11	**Z–**	**–0.3243**	–3.5												
12		SK: 1999; 2001													
13	**Z+**	**0.3895**	4.4			**0.1097**	5.41			**0.3025**	6.91			**0.4939**	4.42
14		CZ: 1994; SK: 2007				CZ: 1994; 2015				HU: 1994				SK: 1994	
15	R^2 / R^2_{sk}	0.999	0.987	0.996	0.995	0.998	0.998	0.990	0.987	0.996	0.996	0.996	0.995	0.989	0.987

Source: Authors' calculations based on data published by IMF and OECD