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## Real convergence in the CEECs, euro area accession and the role of Romania

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### Abstract

The paper is aimed at studying the absolute and conditional convergence in the Central and Eastern European countries. Given that these countries have common roots and their economies have experienced similar challenges over time, the regional convergence in the CEE region might be seen as an intermediary stage of the CEE participation to the EMU. The case of Romania is particularly examined, with a focus on its macroeconomic performances and the role it plays in the process of regional convergence. In the empirical section the GDP growth is regressed upon a number of macroeconomic indicators in order to assess the absolute/ conditional convergence and to highlight the determinants of growth. The study has a longitudinal dimension and uses panel data techniques. Several estimators are used in order to get robust results and to allow us comparing the empirical findings. The paper finds empirical evidence on both absolute and conditional convergence in the CEE countries, and identifies the main drivers of regional growth. The presence of Romania among the CEE countries is a key element of the absolute convergence, while the conditional convergence occurs anyway. In the light of these results, the paper contributes to the growing literature in the field and brings additional evidence for convergence in the CEE region.

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### 1. Introduction

The paper has an empirical focus, namely to measure the state of regional convergence of the ten new EU member states (EU10) stemming from the former Communist regime, i.e. Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia. This list sums up all the countries that acceded to the EU in the last two phases of enlargement, with the exception of Cyprus and Malta. We left the two smaller countries intentionally out of the research focus, as they were established democracies long before their accession to the EU and they also don't share the particular traits of the Eastern bloc. Our paper contributes to the growing literature in the field, including the two new additions to the EU, namely Bulgaria and Romania, which were often omitted in previous studies concerning convergence. We believe that in the context of an enlarging EU and EMU, the empirical investigations of regional convergence become increasingly important.

Subsequently, the paper follows to point out the importance played by Romania in the achievement of absolute and conditional convergence in the CEE region. The general macroeconomic context in Romania is approached and particularly detailed before and during the financial crisis.

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Despite of the impressive number of empirical studies aimed at stating absolute and conditional convergence in the EU at different stages of its enlargement, the literature on regional convergence in the CEE is still poor and divergent at some points. Since the CEE countries share a number of common peculiarities arising from their communist roots, the regional convergence might be an issue of interest, also in the light of the future participation of the CEE countries at the EMU.

The analysis of GDP growth and its determinants is approached in a longitudinal perspective and uses panel data models which are applied on a period of 11 years. To get robust results, but also to allow including endogenous explicative variables of growth, several estimation methods have been compared, in the framework of the fixed effects regression models.

The paper is structured as follows. Section 2 surveys recent literature on convergence in the EU and EMU region with a particular focus on Romania. Section 3 describes the methodological framework used for investigating conditional convergence among the EU10. The data, variables and model are presented in section 4. Section 4 also includes recent developments of the financial crisis and its effects on Romania's efforts to stay on the path of real convergence. Section 6 comprises our main conclusions.

## **2. Literature review**

The ten transition countries analysed in this paper have undergone profound changes once they abandoned the centralised economy and embarked on their journey to becoming market economies. Officially, transition was considered to be over once these countries were allowed to enter the European Union. Still another important challenge lay ahead: the adherence of these states to the euro area, which officially implies the fulfilment of the Maastricht (nominal) convergence criteria. To date, just two of the EU10 countries, namely Slovenia and Slovakia joined the euro area. Many economists are wondering though whether these two and the remaining of EU10 are sufficiently prepared for the real convergence process.

At present, the fulfilment of nominal convergence criteria in a sustainable manner is necessary for the participation of a new EU country in the EMU, while the real convergence is strongly needed for the sustainable development of the enlarged European Union in the long term. Also, in the context of EMU enlargement, the real convergence allows the EU monetary policy to be effective for all countries.

Before examining the actual stage of the nominal and real convergence in the EU and within its regions, the causal relationship between nominal and real convergence could provide insights to their importance in the assessment of progress made in the European integration process. The empirical evidence (Lein-Rupprecht et al., 2007; Lein et al., 2007) indicates that the process of real convergence influences the process of nominal convergence or price level catch up with the euro area, through the channels of productivity growth and trade openness; i.e. openness has a negative impact and productivity growth a positive one. Other papers (Šmídková, 2001; Herrmann and Jochem, 2003) study the compatibility between nominal and real convergence and find supportive evidence only in some EU countries.

The enlargement of the EMU toward the CEECs has been extensively approached in the literature. Bergs (2001) made an early assessment of the Central and Eastern European (CEE) countries prior to their EU accession whether they are truly prepared for the EMU, besides the Maastricht criteria, stressing the role of regional and cohesion policy in this respect. The same question was approached by Bjorksten (2000), who analysed real convergence in the enlarged euro area, by means of case studies (Greece, Portugal, Ireland), as well as in the states of the USA and Canada. Figuet and Nenovsky (2006) investigate to what extent Romania and Bulgaria are able to adopt the common economic (and above all monetary) policy of the EU, and to what extent the convergence to the EU stimulates the economic development of these countries. They analyse the degree of nominal, real and financial convergence and synchronization of the economic cycle with that of the European Union, using the unconditional  $\beta$  convergence approach. The panel consisting of four economies (Bulgaria, Romania, Czech Republic and Hungary) carried the result that Bulgaria was advancing faster at that time than Romania towards its integration into the common dynamic of the European economy, showing more convergence.

A part of the literature considers that CEE countries should not rush to join the euro even if they meet the nominal criteria (see Orłowski, 2001, Kocenda et al., 2005) but rather wait until real convergence according to the Optimal Currency Area (OCA) theory is well under way (Rinaldi-Larribe, 2008). The latter study, which is based on business cycle synchronisation shows that adopting the euro too early and following a policy of fiscal consolidation, in order to control inflation, will induce a risk of slowing the growth trend and the economic catch-up of these countries.

Another part of the literature (e.g. Rostowski, 2003) advocates that a sooner joining of the euro area would benefit the interests of CEE countries and disapproves the conflict between nominal and real convergence, as it was pointed out by various authors (see De Grauwe and Schnabl, 2004). De Nardis et al. (2008) study the euro effect on trade integration and find a short run intra-Euro zone pro-trade effect, following the adoption of the single currency. This finding also supports a sooner adhesion to the EMU.

Still, other authors, such as Dragan and Pascariu (2008), by analysing the Romanian-EU convergence argue that Romania should not rush in or slow down, but rather try to choose the appropriate moment to enter the euro area.

Overall, the results in the literature on nominal and real convergence are mixed. Besides different sample periods and country coverage, the divergences in results appear to be driven by different methodologies. Traditionally, two main definitions of convergence have been used in the literature:  $\beta$  convergence, which implies a negative correlation between the growth rate of per capita GDP and its initial level, for a given cross-section of countries, and  $\sigma$  convergence, which implies a reduction in the dispersion of per capita GDP within a sample of countries.

As mentioned in the EU Treaty, the economic and social cohesion must balance the economic growth. In this light, the study of regional disparities becomes particularly important. At a country and regional level the sigma convergence's analysis confirms a reduction of disparities over time while the beta convergence - regarding per capita income, employment and productivity - also applies for almost all EU territorial aggregates (Lein-Rupprecht, 2007; Marelli, 2007).

Kowalski (2003) analysed nominal and real convergence in alternative exchange rate regimes in CEE countries and their implications for EMU accession, while Frankel (2004) studied real convergence in the CEE countries based on trade patterns and cyclical correlations. Kocenda et al. (2005) made an examination of the nominal and real convergence of the 2004 ten new EU members with a broader approach to fiscal and inflation convergence. Their results indicate slow but steady per capita real income convergence, significant inflation and interest rate convergence, but a lack of fiscal convergence. Lein-Rupprecht, Leon-Ledesma and Nerlich (2007) assessed the empirical relevance of real convergence on nominal convergence for new EU member states and showed that productivity growth has had a positive impact and openness a negative one on price level convergence with respect to the euro area. The determinants of growth and of the catching-up process in CEE countries were summed up by Arratibel et al. (2007), who investigated convergence by means of a production function approach. Their conclusion was that the real convergence process is far from finished.

More recent studies included Romania and Bulgaria in the examination of convergence to the EU or the euro area, again by using different sets of variables or country samples, with interesting results.

Bojesteanu and Bobeica (2008) assessed the degree of business cycle synchronization between the newest member states and the euro area. Their results demonstrate that there is a common business cycle in the euro area and that most of the candidate countries exhibit convergence with this group, with the remarkable exception of Estonia, Lithuania, Slovakia and Romania. Arratibel, Furceri and Martin (2008), using panel estimations for the period 1995-2006, showed that differences in exchange rate volatility were associated to different macroeconomic variables influencing real convergence in CEE countries. Mihaljek and Klau (2008) estimated the Balassa-Samuelson effect for CEE countries from the mid-1990s to the first quarter of 2008. The conclusion of their study was that the above-mentioned effects are clearly present.

Caporale et al. (2009) analysed trade specialisation dynamics in Romania and Bulgaria vis-a-vis the core EU member states, focusing on whether there is a shift towards intra-industry trade leading to economic convergence, using static and dynamic panel data methods. Their result shows that intra-industry trade has indeed increased, but rather vertically than horizontally, and the emerging production patterns are rather complementary than competitive.

Finally, Borys, Polgar and Zlate (2008) focused on real convergence and its determinants in the candidate and potential candidate countries to the euro area. Using panel econometric techniques on a sample of 15 transition economies between 1993 and 2005, the analysis revealed that total factor productivity growth has been the main driver of convergence, followed by capital deepening, whereas labour has contributed only marginally to economic growth.

A part of the literature on economic convergence in the EU focuses on the development gap between the Balkans and the EU. For instance, Ouardighi and Kapetanovic (2009) find that the income convergence is higher during the 2000s for the EU-27, while the majority of convergence took place during the second half of the 1990s for Balkan countries.

### 3. Methodology

The aim of this paper is to investigate whether there is evidence of unconditional and conditional convergence in the CEE region, as defined by Barro and Sala-i-Martin (2004) in their seminal empirical work on economic growth and convergence. Subsequently, we follow to find the main drivers of growth in the region. This allows us to examine for instance whether the same determinants lead to real convergence with the EU and EMU areas on a side and within the CEE region on the other side.

The theory of convergence states that poorer countries should advance faster than richer ones when different countries are at relative points relative to their balanced growth paths and when structural differences between countries are considered. The rate of convergence is a fundamental part of this theory and allows measuring, through the  $\beta$  coefficient, the speed of convergence of an economy towards its steady state. In literature, two types of convergence rates can be identified upon the nature of differences across countries. When the initial capital endowment is the only difference across countries, the  $\beta$ -convergence is a convergence to the same steady state and is known as unconditional (absolute)  $\beta$ -convergence. When there are structural differences across countries, the  $\beta$ -convergence is a convergence to different steady states but a common speed and is called conditional  $\beta$ -convergence.

Over time the cross-sectional tests used in the analysis of absolute convergence were criticized for over-rejection of the null hypothesis of no convergence (Bernard and Darlauf, 1996). This has moved attention to conditional convergence. But the need to meet the EU nominal convergence criteria for participation to the EMU has enhanced interest in absolute convergence.

In general, when studying the achievement of real convergence in a dynamic perspective, two main types of approaches may be followed. (i) The most convenient approach is usually the cross-sectional one, in which the dependant variable, i.e. the GDP per capita growth rate, is averaged over the entire period. The explicative variables are either annual averages or values at a certain moment during the period of analysis<sup>3</sup>. (ii) The panel approach captures the longitudinal dimension of the dependant variable and some explicative variables, by using annual observations. In literature, both approaches have been used to explain the determinants of growth and convergence process within the EU.

When longitudinal data are available, the panel data analysis is generally preferred for a number of reasons, such as: it takes into account the heterogeneity into the units of analysis by allowing individual-specific variables, it gives more variability, less collinearity among variables, it is suited to study the dynamics of change and enables studying more complicated models (Baltagi, 1995). Compared to the cross-sectional approach, the panel approach can additionally capture the influence of certain periods of time on the economic growth, e.g. economic recessions, financial crisis, by including dummy variables in the panel regression.

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<sup>3</sup> The cross-sectional analysis has been extensively applied in the past when longitudinal data were not highly accessible (Mankiw, 1992; Suppel, 2003), but it carries a number of disadvantages in comparison with the panel analysis.

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The advantages of panel analysis over the cross-sectional approach also regard the econometrical aspects. For instance, in the panel models, when using fixed effects in the ordinary least squares (OLS) and two-stages least squares (2SLS) regressions, we can control for the unobserved heterogeneity. Also, endogeneity problems may be addressed in the panel approach through the 2SLS regressions. This particular issue cannot be solved in the cross-sectional approach.

But the estimation of economic growth regressions usually raises serious measurement problems (Mankiw, 1992). For instance, the explanatory variables are typically endogenous and measured with error. The initial level of efficiency is one of the omitted variables in the conditional convergence regression. Since this unobserved variable is correlated with the regressor "initial level of income", the least squares parameter estimates are biased.

The last few years have seen important progress in the empirical literature on economic growth and convergence due to the increasing number of available sophisticated panel data and time series models. The first-differenced generalized method of moments (GMM) is currently perceived as one of the best panel data method (Caselli et al., 1996; Borys et al., 2008). This model takes first-differences to remove unobserved time-invariant country-specific effects, and then instruments the regressors in the first-differenced equations using levels of the series lagged two periods or more, under the assumption that the time-varying disturbances in the original levels equations are not serially correlated. Despite of advantages that this model brings over the cross-sectional regressions (e.g. it takes into account the unobserved country-specific effects through the fixed effects and provides consistent estimates in the presence of endogeneity problems and measurement errors), it might involve large finite sample biases. When the time series are persistent and the number of time series observations is small or time-periods available are short, the lagged levels of explicative variables are weak instrumental variables and the first-differenced GMM appears as a problematic estimator. This difficulty is removed when using the system GMM estimator, as suggested by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator uses lagged first-differences as instruments for equations in levels, which are valid under a restriction on the initial conditions<sup>4</sup>. This set of estimators are designed for dynamic "small-T, large-N" panels that may contain fixed effects and idiosyncratic errors that are heteroskedastic and correlated within but not across individuals.

In this paper we have chosen to use panel techniques to explain the effect of the changes in GDP per capita growth and other factors on economic growth, over time. Not only the economic growth as dependant variable, but also the explicative variables are represented in a longitudinal perspective, in order to bring more additional explicative power into the model. For the reasons exposed above, the panel data model that we use in the paper are based on the OLS, 2SLS, first differenced- and system GMM estimators.<sup>5</sup>

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<sup>4</sup> The econometrical models underlying the first-differenced GMM and system GMM estimators are not comparatively examined here as the paper has an empirical focus, and not a methodological one. The models are detailed in Arellano and Bond (1991) and Blundell and Bond (1998).

<sup>5</sup> We apply in the paper both GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) and the first-differenced GMM estimator (Arellano and Bond, 1991) for comparative reasons and to follow

The econometric model followed in the paper is the following:

$$y_{it} = \beta_1 X_{it} + \beta_2 Y_{it} + v_{i1} + \varepsilon_{it} \quad (1)$$

Where  $y_{it}$  is the annual rate of GDP per capita growth for country  $i$  in the year  $t$ ,  $X_{it}$  is a vector of exogenous explicative variables,  $Y_{it}$  is a vector of explicative variables that are suspected to be endogenous, i.e. to be correlated with current or past errors,  $v_{i1}$  represents the time-invariant country-specific effect and  $\varepsilon_{it}$  is the error term.

The equation (1) has the proprieties:

$$E(v_{it}) = E(\varepsilon_{it}) = E(v_{it} \varepsilon_{it}) = 0 \text{ and } E(\varepsilon_{it} \varepsilon_{jt}) = 0 \text{ for } i \neq j \text{ and } t \neq \tau \quad (2)$$

In order to eliminate the time-invariant country-specific effect and thus to omit variable bias, equation (1) will be written as follows:

$$y_{it} - y_{it-1} = \beta_1 (X_{it} - X_{it-1}) + \beta_2 (Y_{it} - Y_{it-1}) + \varepsilon_{it} - \varepsilon_{it-1} \quad (3)$$

Considering that the term  $Y_{it}-Y_{it-1}$  in the equation (3) is correlated with  $\varepsilon_{it}-\varepsilon_{it-1}$ , instrumental variables  $Y_{it}-X_{it-p}$  ( $p>1$ ) are therefore used. We assume there is no serial correlation in the error term and the regressors  $Y_{it}$  are weakly exogenous. Arellano and Bond GMM estimator (1991) results from the following moment conditions:

$$E[Y_{it-p} (\varepsilon_{it} - \varepsilon_{it-1})] = 0 \text{ for } p>1 \text{ and } t=3, \dots, T \quad (4)$$

Arellano and Bover (1995) suggest the use of lagged first-differences of the series as instrument for equations in levels. The system GMM estimator is obtained from (4) by adding the original equation in levels to the equation in differences.

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the most recent developments in the field (Levine, Norman and Beck, 2000; Blundell, Bond and Windmeijer, 2000; Bond, Hoeffler and Temple, 2001), even though we don't use small number of time-periods based on time-interval averages.

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## **4. Data**

### **4.1 Variable description**

Our sample consists of 10 CEE countries, which are analysed in the period 1998-2009 through different regression models. The GDP growth rate, which is always the dependant variable in our models, is explained by a number of macroeconomic indicators that we detail below.

There is rich empirical evidence in literature suggesting that openness of an economy promotes economic growth (Romer, 1989; Krueger, 1990, Sengupta, 1994). Also, the openness of an economy is a fundamental criterion of the traditional OCA theory and an important factor influencing the costs and benefits of a country's inclusion into the EMU. For these reasons we have included this indicator among the set of variables presumed to explain economic growth in our empirical study. The openness is measured as the sum of imports and exports in the national levels of GDP. We expect to find a positive coefficient of openness in the growth regression. This would indicate a positive impact of trade on growth.

It is well known that economic growth can be stimulated by increasing the amount and types of capital and labour used in production and also by combining them in an efficient way. The contribution of labour to the GDP growth can be measured through the growth of labour productivity.

The GDP growth rate is the central piece of our analysis because is able to highlight the degree of conditional and unconditional convergence and the factors underlying this process. According to the convergence theory, the main factor explaining the GDP growth is the initial level of per capita GDP. In order to assess the absolute/ conditional convergence in the CEE region we expect to find a negative relationship between the two indicators (see figure 2).

The inflation, governmental debt, gross capital formation, household final consumption and exchange rate are other explicative variables included in the econometric models. We expect to find positive relationships between the economic growth on a side and the gross fixed capital formation, population growth and inflation on the other side, as well as a negative relationship between growth and exchange rate. The impact of governmental debt on growth is not the same for the whole dataset. It mainly depends on the size of debt and type of receptor country. In general, large debt stocks negatively affect growth while low levels of debt stimulate growth. Therefore, it might be presumed that a small governmental debt could enhance economic growth.

### **4.2 Macroeconomic performances in the CEE region**

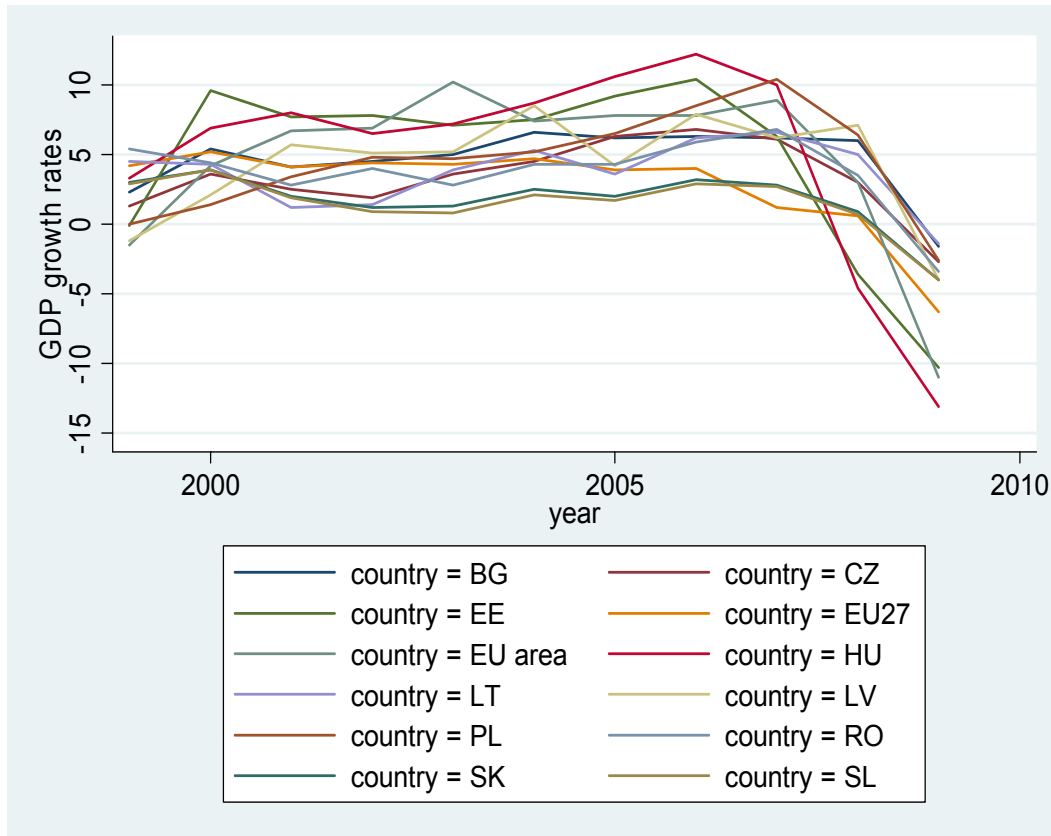
The picture of macroeconomic performances in the CEE region allows distinguishing some common trends but also national or sub-regional (e.g. the Baltic countries) peculiarities between 1998 and 2009.

Among the CEE countries, in 2008 Slovakia and Hungary were the most open economies, while Romania, Poland and Latvia were the closest economies. Estonia is



the only countries which has gradually decreased its degree of openness from 1998 onwards. An important feature of all CEE countries is that they have higher degrees of openness in comparison with the Western EU countries or with the whole EMU group.

Figure 1. Dynamics of GDP growth rates between 1998 and 2009\* in CEE countries



Note. \*EUROSTAT forecasts.

Source. EUROSTAT.

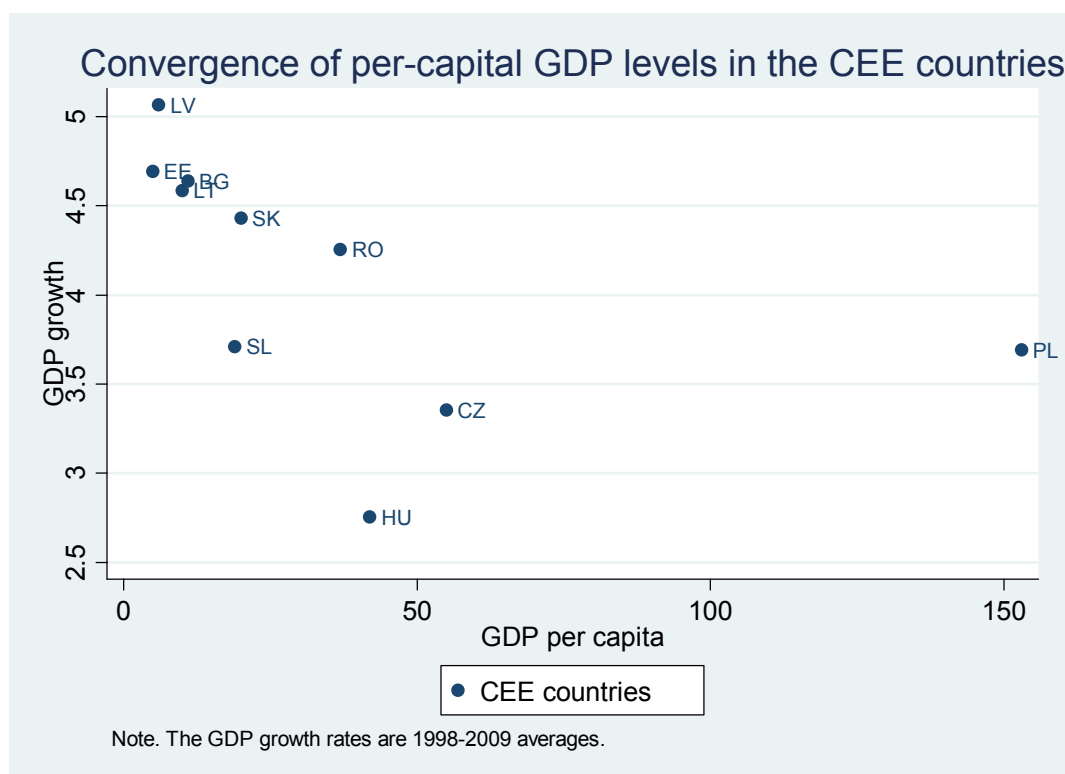
The labour productivity, measured per person employed, has continuously increased in the last decade in all CEE countries, with an exception in 2007/2008 when the stagnation occurred for a number of countries, like Estonia, Latvia and Slovenia. The EMU countries had negative dynamics over the entire period of analysis.

The figure 1 shows the trend of GDP growth rates in the CEE region between 1998 and 2009. Apart from the national specific patterns on short term, a general common trend can be identified. The slightly growth from 1998 to 2006 is followed by a stagnation and then by a sharp decrease from 2006 onwards, below the initial levels in 1998. The ranking of the “faster CEE countries” has changed over time. While in the first stage of the period of reference, Poland, Hungary and the Czech Republic had the highest GDP growth rates, right before the start of financial turmoil in 2008, the Baltic countries had the highest growth rates.

In the context of the financial crisis, the international forecasts estimate a decrease in the level of GDP by 5.2% on average in 2009 and then, in 2010, a growth of 1.4%. Among the CEE group, the Baltic countries are expected to face the most serious falls in the GDP growth rates.

Figure 2 plots the initial levels of per capita GDP against the average levels of the GDP growth rates for the CEE countries. The negative relationship between the two variables suggests that the CEE countries are “catching up”. Poland has a different pattern as its initial level of per capita GDP is considerably higher in comparison with the rest of countries in the region. Despite of this initial advance, Poland had a medium average growth rate in this period of time. Romania looks to be perfectly integrated into the CEE area.

Figure 2



Population growth rates were mostly negative in the period of analysis, but a slightly and continuous increase in the growth rates is evident from one year to another, not only in the CEE countries, but also in the EMU countries. The household final consumption had a positive dynamic over the entire period of analysis in the EU, as well as in the CEE. As expected once the crisis unfolded, 2009 brought a sharp decrease of the household final consumption in all EU countries.

The gross fixed capital formation by private sector, measured as percentage of GDP, had two different dynamics within the CEE. In Romania and Bulgaria a

continuous increase is evident over the entire period, while for the most CEE countries the highest levels were reached in 1998 and 1999.

As regards the governmental debt, the CEE countries have either low levels during the whole period of time, like Estonia, Latvia and Romania, or high levels, as it is the case of Hungary.

Most of CEE countries have done serious progress in reducing the inflation rate around or below 5%, from 2003 to 2005/ 2006<sup>6</sup>. After 2005/2006, the inflation rate increases in all CEE countries. During this period of time, the inflation rate has slightly increased in the EU, as well as in the EMU. Due to the financial crisis, a common feature of all EU countries is deflation.

**Table 1. Key macroeconomic indicators for Romania**

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDPG	-1.2	2.1	5.7	5.1	5.2	8.5	4.2	7.9	6.2	7.1
POPG	-0.17	-0.15	-0.11	-2.66	-0.28	-0.28	-0.24	-0.22	-0.21	-0.17
INFL	45.8	45.7	34.5	22.5	15.3	11.9	9.1	6.6	4.9	7.9
OPEN	53.8	63.8	66.9	69.9	69.5	74.1	68.5	68.7	66.4	66.0
GFCF	16.1	15.4	17.8	17.9	18.0	18.7	19.9	20.5	24.7	27.9
PROD	n.a.	n.a.	n.a.	29.3	31.1	34.4	35.9	39.5	43.7	47.6
HCON	37.9	42.5	41.7	42.9	43.4	43.3	54.4	57.1	61.5	62.1
DEBT	21.9	22.5	25.7	24.9	21.5	18.7	15.8	12.4	12.7	13.6

*Notes.* GDPG = real GDP growth, POPG = population growth, INFL = inflation, OPEN = openness of the economy, GFCF = gross fixed capital formation as % of GDP, PROD = labour productivity per person employed (EU27=100), HCON = final consumption by private households (EU27=100), DEBT = public debt as % of GDP. Source for all data: EUROSTAT.

<sup>6</sup> For instance, Bulgaria got a minimum level of 2.3% inflation rate in 2003. After that, the dynamic has changed and the inflation rate has gradually increased reaching 12% in 2008. Romania reached the minimum level of 4.9% only in 2007.

As shown in the Table 1, the dynamics of main macroeconomic indicators reflect the improvement of the general economic context in Romania in the last decade. Remarkable progress has been made in the direction of the gross fixed capital formation, inflation decrease, growth of household consumption and increase of labour productivity. The main economic challenges have been the high inflation rate, the low rate of labour productivity and the low degree of openness, while the low governmental debt has been the only comparative advantage that Romania had in relation with the other CEE countries.

### **4.3 Effects of the financial crisis**

Despite the tremendous efforts made by CEE countries towards establishing a market economy and the rise in living standards over the last two decades, the tide of radical reforms necessary for the process of catching up with former EU members has slowed down with the spreading of the international financial crisis. The convergence of the new member states in the CEE region towards the Euro area will shift now from a fast-track move to a slow-pace effort, with results expected only in the long term.

Moreover, hopes of adopting the euro sooner, in order to benefit from its stimulating effects at macro and microeconomic level, have vanished in the face of the crisis, with governments of CEE countries trying to take short-term measures for putting the economy back on track. The crisis has stopped the economic boom of several CEE economies. The rise of unemployment, the drop in investments and the rigidity of financial markets are among the effects that will most probably delay the entry of candidate countries to the euro area for a while.

Nevertheless, the economies of new member states have not lost their attractive elements for foreign investors, such as a well-educated workforce, closeness to Western markets and potential for productivity growth. Thus, it can be anticipated that the slowdown of the convergence process due to the crisis will not be an obstacle for investors, and these countries will recommence the race of catching-up.

For Romania, the goal of monetary policy in the last few years has been focused on preserving macroeconomic stability combined with reform measures that should bring the country in line with convergence to the euro area. Romania has found itself in a difficult position once the financial crisis broke out, with public deficit mounting in the last two years in spite of the high growth rate registered. This growth has been made possible though by backing from foreign banks. Romanian affiliates of these banks became used to external financing and the current account deficit has risen, making the Romanian economy vulnerable to the effects of the financial crisis, as the Central bank governor repeatedly stated. The accelerated drop of private capital flows to Romania since the end of 2008 and during 2009 led to a decrease of economic activity, a reduction in external trade, significant exchange volatility and a higher cost of credit.

The Romanian Central Bank initially set 2014 as the year of entering the euro area. In a recent study, Miron and Paun (2009), by means of a “catching-up model” to measure the nominal convergence of the Romanian economy with the euro area, tested if the goal of adopting the euro by 2014 (that means joining the ERM2 in 2012) is achievable, and found positive evidence. Several analysts and even officials of the European Central Bank asserted before the crisis that Romania could meet the

Maastricht criteria earlier and thus adopt the euro. The business environment would enjoy then lower interest rates for credits and reduced fees for bank transfers. Nevertheless, one major shortcoming of early adoption is the loss of the own monetary policy and exchange rate regime which would mean that convergence would be driven from that point onwards by fiscal measures. These measures are, as we have witnessed in the last period, very inconsistent though and changing in the face of the current financial crisis. Due to the severe recession undergone by Romania in 2009 and the subsequent deterioration of the fiscal situation, the target of adopting the euro has been revised to the year 2015, with practical preparations for the changeover still far ahead.

When assessing the stability and convergence programmes in June 2009, the European Commission recommended that Romania should correct its excessive deficit in view of the large imbalances and the economic and financial situation by implementing corrective measures rigorously, as well as to ensure sustainable convergence, in line with the economic policy measures envisaged under the economic programme supported by Community balance-of-payments assistance (European Commission, 2009).

As a consequence, in July 2009, the Council of the European Union decided that an excessive deficit exists. Accordingly, the Council opened the excessive deficit procedure (EDP) for Romania, and recommended the correction below 3% took place by 2011. The recommendation urged Romania to take appropriate measures so as to end the excessive budget deficit with the deadline set to 7 January 2010 for effective action.

Among the measures envisaged the Council stressed the importance of improving the long-term sustainability of public finances by reforming key parameters of the pension system and the restructuring of the public compensation system, including by unifying and simplifying the pay scales and the bonus system (Council of the European Union, 2009).

The Council took into consideration though that the budgetary targets set in the Romanian convergence programme were subject to risks stemming mainly from the global economic downturn and from a much deeper recession than anticipated, which would hinder effective implementation of the planned fiscal measures in 2009.

In an assessment issued in February 2010, the European Commission asserted that Romania managed to reduce the public wage bill and cut public expenditure on goods and services in 2009, in line with the Council recommendation, and has also included in the 2010 budget a package of measures to cut expenditure by around 2% of GDP and to raise revenue by around 0.5% of GDP. Thus, the Commission concluded that the country has taken effective action as required by the recommendation. However, Romania experienced a larger recession than estimated; at around 7% in 2009, against 4% in the Commission's spring 2009 forecast, due to a large drop in exports and a contraction in domestic demand caused by the global economic and financial crisis (European Commission, 2010).

As a follow-up, the Commission proposed to extend the deadline for the correction of the excessive deficit by one year to 2012.

We believe that Romania will have to continue its prudential monetary policy and tighten the fiscal measures so as to get over the crisis and stay in line with its

convergence requirements to the euro area. A faster adoption of the euro, supposing nominal convergence criteria will be met earlier than the self-imposed target of 2015, would be dangerous and not feasible with real convergence missing.

## **5. Empirical analysis**

The empirical analysis is aimed to analyse the achievement of absolute and conditional convergence in the 10 CEE countries, between 1998 and 2008, and to assess the role played by Romania in the regional convergence process. This section is organized as follows: First, the unconditional beta convergence model is applied to examine whether the absolute convergence theory applies in the CEE area. Three sub-groups of countries are considered here in order to analyze the impact that the EMU and Romania have in the CEE regional convergence. At this step, EMU can be seen as a Western neighbour of the CEE region, while Romania is an important member in the region that might be suspected to delay the convergence process.

Second, the conditional convergence among the whole group of ECC countries is analysed, using panel data techniques. The OLS, 2SLS and GMM estimators are comparatively examined and different sub-sets of explicative variables are used to conclude on the most important determinants of economic growth in the CEE region.

In Table 2 we have examined the unconditional beta convergence for three groups of countries, defined through model 1, model 2 and model 3. In all three models, the average of the annual GDP growth rates is regressed upon the initial level of per capita GDP. The negative and significant coefficient of the initial level of the per capita GDP indicates the fulfilment of the unconditional beta convergence model and the convergence, in absolute terms, toward a steady-state. The estimates suggest that this theory fully applies within the region formed by all CEE countries and the EMU group (model 1). When Romania is included into the group of CEE countries, then the regression coefficients, though weakly significant, still highlight the absolute convergence (model2). But when Romania is excluded from the model (model 3), the result is not significant anymore, even though the value of per capita GDP coefficient is the same. These findings lead to the conclusion that Romania plays an important role in the achievement of absolute convergence in the CEE region. This result is not surprising and is in line with previous research applied on the CEE countries (Amplatz, 1993).

Table 2. Unconditional beta convergence model

Explicative variables	Model1		Model2		Model3	
	Estimate of $\beta$	St.err.	Estimate of $\beta$	St.err.	Estimate of $\beta$	St.err.
Per capita GDP, 1998	-0.0134***	0.0021	-0.0079*	0.0049	-0.0079	0.0052
Constant	2.0368***	0.1405	4.4013***	0.2737	4.3853***	0.3004
R squared	0.81		0.24		0.24	
Nr. of countries	11		10		9	

Notes. \*  $p < 0.15$ . Model 1 includes the CEE countries<sup>7</sup> and the EMU, EMU being the 11th observation in the model; Model 2 includes the CEE group; Model 3 includes CEE without Romania.

Before to present the results of conditional convergence model under different estimators, the OLS model is applied on two groups of countries, i.e. CEE without Romania (model 2) and CEE including Romania (model 1), in order to assess the importance played by Romania in the process of regional conditional convergence. In a comparative perspective, the conditional convergence in the CEE region becomes more powerful when Romania is included in the model. This result is suggested by the values of per capita GDP coefficients in Table 3. Also, the population growth becomes a significant explicative variable of growth, when passing from model 2 to model 1.

Overall, both the conditional and unconditional convergence models prove that Romania has an important role in the CEE regional convergence.

The conditional convergence in the CEE region is analyzed using different estimators. First, econometric tests<sup>8</sup> are applied to identify the endogenous variables. This is because in the presence of endogenous explicative variables, the OLS estimation leads to biased and inconsistent parameter estimates. The endogeneity problem requests finding instruments in order to include the problematic explicative variables in the 2SLS and GMM regression models. But, in general, it is difficult to find good instruments. The IV estimators for instance are innately biased, have poor performance in small samples; in the presence of weak instruments the loss of precision is severe and overall they may be no improvement over OLS. For this reason, we use first the fixed effects OLS model to analyse the conditional convergence<sup>9</sup>. At this step, the variables suspected to be endogenous in the list of regressors are excluded.

<sup>7</sup> The CEE countries included in the regression models are: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Romania, Slovenia, Slovakia, Hungary and Poland. For the reasons detailed in introduction, Cyprus and Malta have been excluded from analysis.

<sup>8</sup> The endogeneity problems are diagnosed by the command *xtivreg2* in STATA.

<sup>9</sup> By computing the F-statistic we reject the null hypothesis that intercepts are the same for all countries. This finding supports the fixed effects model.

Table 3. Conditional convergence, OLS estimates

Explicative variables	Model 1		Model 2	
	Estimate of $\beta$	St.err.	Estimate of $\beta$	St.err.
Log of per capita GDP	-4.7085**	2.0465	-4.2863***	2.0690
Trade openness	0.1050***	0.0228	0.0979***	0.0236
Population growth	-0.57380*	0.3351	-0.4192	0.4206
Labour productivity	0.2826***	0.1040	0.2885***	0.1059
Exchange rate	-0.0935**	0.0447	-.0970**	0.0443
Inflation	-0.1269**	0.0639	-0.1930***	0.0778
Number of countries	10		9	
R squared	0.38		0.41	
Rho	0.97		0.97	

Notes. (1) \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . (2) Dependant variable: Annual growth of GDP per capita, 2-year lagged value. (3) Model 1 includes Romania in the CEE group and model 2 excludes Romania from the CEE group. (4) For the variables per capita GDP and population growth we have used their 2-year lagged values.

Results presented in Table 3 indicate that the conditional convergence holds under the OLS estimation. When considering a number of explicative variables in the regression model, the  $\beta$  coefficient becomes “more negative” than in the unconditional convergence model. This suggests a higher speed of convergence for the group of CEE countries.

All explicative variables included in the model are significant. Even though population growth has a weak significance, it suggests a strong negative effect on the GDP growth. Beside population growth, the exchange rate and inflation are in a negative relationship with economic growth. Trade openness and labour productivity have high significant and positive influences on the GDP growth.

In Table 3 the *rho* statistic indicates that the proportion of the total variance attributed to the panel level variance component is high and significant (according to the log likelihood test). This supports the longitudinal approach to conditional convergence once again.

The 2SLS estimation in Table 4 still strongly supports the conditional convergence, especially when the 3-year lagged value of per capita GDP is used. The only significant explicative variables in the model are governmental debt, gross fixed capital formation (both variables carrying a negative impact on growth) and labour productivity (powerful and positive effect on growth).



Table 4. Conditional convergence (fixed effects, 2SLS estimator)

Explicative variables	Estimate of $\beta$	St.err.
Log of per capita GDP	-5.0850**	2.2955
Trade openness	0.0888***	0.0254
Population growth	0.2044	0.4937
Labour productivity	0.3278***	0.1221
Exchange rate	-0.0475	0.0477
Inflation	-0.0202	0.0698
Governmental debt	-0.0804**	0.0356
Gross fixed capital formation	-0.2534**	0.1187
Household final consumption	-0.0340	0.0582
Number of countries	10	
R squared	0.35	
Rho	0.96	

Notes. (1) \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . (2) Dependant variable: Annual growth of GDP per capita, 3-year lagged value. (3) The 2SLS estimates have been obtained by using the command `xtivreg2` in STATA, where the instrumented variable was labour productivity. (4) Inflation, gross fixed capital formation and household final consumption are included in the model through their 1-year lagged values, while the per capita GDP uses the 3-year lagged value.

In Table 5 we report the estimates resulted from the first-differenced GMM and system GMM models. A number of 3 explicative variables out of 9 have been identified as being endogenous<sup>10</sup>, i.e. gross fixed capital formation, governmental growth and household final consumption. As instruments, we have used their lagged values and have conducted the selection of appropriate instruments upon the Sargan/ Hansen test. In the case of the gross fixed capital formation and household final consumption, the 2-year lagged values seem to be better instruments than their 1-year lagged values. Since for the variable governmental debt the econometric tests have indicated that the lagged values are not good instruments, this covariate has been excluded from analysis. Anyway, preliminary tests indicate that its influence is rather weak and insignificant.

The GMM model is comparatively examined according to the Arellano-Bond (1991) specification (first differenced GMM) and Arellano and Bover, (1995)/ Blundell and Bond (1998) specifications (the system GMM estimator).

<sup>10</sup> The endogenous variables have been identified using the option `endog` in the STATA command `xtivreg2`.

Table 5. Conditional convergence: Fixed effects first differenced and system GMM estimators

Explicative variables	System GMM, fixed effects <sup>3</sup>	First-differenced GMM , fixed effects <sup>4</sup>
Log of per capita GDP	0.1172 0.4098	-4.9289*** (1.9665)
Population growth	0.0440 (0.4576)	0.3869 (0.2596)
Trade openness	0.0382*** (0.0150)	0.0958*** (0.0257)
Gross fixed capital formation	0.1341 (0.1694)	0.0528 (0.1033)
Labour productivity	0.0990*** (0.0382)	0.4583*** (0.1356)
Household final consumption	0.1734*** (0.0628)	0.1125** (0.0542)
Inflation	0.0139 (0.0779)	-0.0594 (0.0569)
Exchange rate	-0.0090** (0.0047)	-0.1052*** (0.0254)

Notes. (1) \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . (2) Dependant variable: Annual growth of GDP per capita. (3) The system GMM model is estimated using the command `xtbonds2` in STATA and fulfils the Arellano and Bover, (1995) and Blundell and Bond (1998) specifications (4) First-differenced GMM model is estimated by the command `xtivreg2` in STATA and uses the Arellano-Bond linear dynamic panel-data estimation (`xtbonds2` in STATA). (5) For the variables per capita GDP we use the 1 year-lagged value and for the variables gross fixed capital formation, labour productivity and household final consumption, the 2-year lagged values are used.

As shown in Table 5, the first-differenced and system GMM models provide different results when assessing the conditional convergence within the CEE region. We find significant evidence of conditional convergence when using the first differenced GMM (as the coefficient of per capita GDP is negative and significant). This empirical finding is not supported by the system GMM model, as the coefficient is, in this case, positive and not significant. The 1-year lagged value of per capita GDP has been used in the model because the 2 or 3-year lagged values do not improve the models.

The two GMM specifications provide close estimates for most of explicative variables. With the exception of inflation (which is not significant in both models), all coefficients have the same sign, suggesting the same type of influence on economic growth. In the first-differenced GMM, the most powerful significant regressors are first the labour productivity and second the exchange rate and household final consumption. But in the system GMM, the household final consumption is the most powerful

regressor. Population growth has a positive coefficient with a low significance in the first differenced GMM, indicating a possible positive influence of this variable on GDP growth. Both models show negative relationships between the exchange rate and economic growth.

In conclusion, the trade openness, labour productivity and exchange rate are the most robust and exogenous determinants of growth. They have the same impact on growth, under all estimation methods. The household final consumption has also a positive effect on growth through its instrumental variable, as resulted from the GMM models. Inflation is negatively related to growth, as shown by most of methods, but this relationship is either insignificant or has a weak significance. For governmental growth, gross fixed capital formation and population growth, the models provide insignificant and divergent estimates in some cases.

## **6. Conclusions**

The paper finds both unconditional and conditional convergence in the CEE region. Despite of the economic gap that Romania has in comparison with the rest of the CEE countries, its presence in the CEE group enhances the regional economic convergence. This is a relevant finding, given the weak evidence for conditional convergence within CEE or among the transition countries in the literature.

As resulted from our empirical section, the absolute convergence becomes significant only when including Romania in the CEE countries. The presence of EMU group as the 11th member of our sample significantly deepens the convergence process. The unconditional convergence is significant, independent on the Romania's presence among the CEE countries. When considering Romania as a part of CEE, the evidence of conditional convergence becomes even stronger.

To sum up, the conditional convergence within the CEE area has been assessed in our paper using a number of four estimation methods, in order to get robust results. According to all of them, the labour productivity and trade openness are the most important determinants of economic growth, having a positive and important role in fostering the regional economic convergence. Other papers confirm the supremacy of these factors among the determinants of growth in the transition or CEE countries (e.g. Borys, Polgar and Zlate, 2008). The exchange rate has a weaker significance and is in a negative relationship with growth. This is in line with previous papers in the literature (McKinnon and Schnabl, 2004; Schnabl, 2007). When the endogeneity is controlled for in the GMM models, the household final consumption is found to be positively related to growth. Governmental debt also has a weakly significant but positive impact on growth.

For the rest of explicative variables, the estimation methods lead to different or insignificant results. Anyway, they explain to a lower extent the GDP growth and have just a lower impact in the conditional convergence process. The sensitivity of results to the estimation methods is partially due to the data availability and limitations in the case of transition countries and also to the low number of observations in the sample.

In conclusion, the CEE countries have experienced convergent economic growth in the last decade, which was mainly driven by labour productivity and participation to the international trade. In order to sustain the economic growth on long term and also

to support the participation of CEE countries to the EMU, foreign direct investments, capital accumulation and economic reforms need to be further stimulated by governments.

The CEECs' target of euro adoption, already reached by Slovenia in 2007 and Slovakia in 2009, has sparked debates about the right timing and pertinence of the Maastricht criteria, due to the crisis implications. Achievement of nominal convergence criteria has become more problematic than it was before the crisis, which induces a number of questions about the adhesion to the Euro area.

Romania will continue its prudential monetary policy and tighten the fiscal measures so as to get over the crisis and stay in line with its convergence requirements to the euro area. A faster adoption of the euro, supposing nominal convergence criteria will be met earlier than the self-imposed target of 2015, would be dangerous and not feasible with real convergence missing.

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