The Nominal and Real Convergence of the Romanian Economy to the Euro Area

This paper presents a theoretical review of the concept of convergence and a study of Romania’s degree of nominal and real convergence to the euro area. Nominal convergence was based on optimum growth theory, while real convergence emerged from the neo-classical convergence hypothesis. The paper reviews the methods for analyzing convergence, as well as empirical work studying real and nominal convergence in relation with CEE countries. The relationship between nominal and real convergence is addressed in relation to the Balassa Samuelson effect, which plays an important role in the economic evolution of CEE countries. The case of Romania is presented through an empirical analysis of the degree of nominal and real convergence, using the sigma convergence method.

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Introduction

The convergence as a concept is used today especially in the European context, and in relation with the Maastricht criteria which represent the conditions for entry in the European Economic and Monetary Union. The establishment of these criteria was based on the theory of optimum currency area. Since the Maastricht criteria are concerned mainly with nominal variables (inflation rate, interest rate, budget deficit, public debt, nominal exchange rate), the convergence process regarded strictly from this perspective, of the entrance of a country in the euro area, is called nominal convergence.

The convergence concept, however, did not appear in the context of the European integration process; it emerged from the wide body of literature in the field of growth theory and from the preoccupation of this literature to find the determinants of economic growth of a country. From this perspective, convergence refers to the economic growth process which allows a less developed country to „catch-up” with the level of development of a developed country, usually measured in terms of GDP per capita. Therefore real convergence originates in the growth theory. However, some authors also include here the „real” concept determined by the theory of optimum currency areas – production diversification, degree of openness of the economy, labour market flexibility or financial integration, concepts that are not found within the framework of the Maastricht criteria. Even the empirical methods used today to quantify the convergence process were developed based on the neo-classical growth theory. These methods are now applied to nominal variables, as well as real variables. A special case regards the financial variables, in which case financial convergence is analyzed.

The importance of the convergence process has grown with the EU accession of CEE countries, which are interested in their perspective to enter the euro area, as well as their potential to speed structural reforms and reach the development levels of older EU members.
1. **Convergence and the theory of optimum currency areas**

In the context of the criticism brought to the Bretton Woods system of fixed exchange rates in the 50s, Robert Mundell (1961) posed an important question of whether the state is an optimum currency area and offered a first definition of the OCA through the labour flexibility criteria: an OCA is an economic region where there is inter-regional labour force flexibility. If regions do not form an OCA, flexible exchange rates are more useful. To these criteria the following contributors to the OCA theory brought a series of criticisms and added new criteria that better define an OCA. McKinnon (1963) views the degree of openness of an economy as an essential criteria for an OCA. He defines the degree of openness as the ratio of tradable to nontradable goods and concludes that smaller economies have more benefits from entering a wider OCA. Kennen (1969) considers that production diversification is a criterion for defining an OCA, as asymmetric shocks are better absorbed by a well-diversified economy.

All these contributions refer to the state of an economy. Another strand of research in OCA takes into account the conditions for creating an OCA in practice. Among these (Ishiyama, 1975), considers the following as still playing an important role in monetary integration: similarity of inflation rates, flexibility of wages and prices and variability of the real exchange rate. Yet another strand of opinions consider that the efficiency of an OCA depends less of the economic criteria and more on practical consideration such as the strength of the commitment taken by the governments, the attitudes of the population and the nature of institutions in general, including the financial ones Ingram (1969, p 97 – 98). Mintz (1979) and Machlup (1977, page 71) have stated that the most important criteria is that the member are willing to give up their independence in terms of money, credit and the interest rate.

The modern contributions to OCA theory are concerned with modelling of the classical criteria using econometric techniques developed in the last decades. Among the most widely used operational criteria in the modern OCA theory are the shock transmission mechanisms and the analysis of shock similarities, as well as the analysis of the response of various policies to shocks. Horvath (2003) makes a review of the categories of modern approaches to OCA theory and gives three main categories: macroeconomic models evaluating the response of different exchange rate regimes to various shocks, models discussion the exchange rate regime under stabilization plans, which has been widely used post 90’s for transition economies, and general equilibrium models based on microeconomic fundaments.
One of the most recent contributions from the latter category is that of Corsetti (2008), whose main result is a new attribute of economies part of an OCA, the convergence of consumption and expenditures models.

The main modern criticism brought to the OCA theory is the endogeneity problem raised by Frankel and Rose (1998). Their argument is that entering a monetary union in itself represents the premise for the newly entered economy to fulfil the classical criteria. Their opinion is based on the premise that the correlation between international trade and business cycles is endogenous in nature. Mongelli (2008) talks about an exogenous character of the OCA theory, in that EMU was mainly created from defensive reasons, in order to reduce the risk of volatility and misalignments during the 20 – years functioning of the European Monetary System, and in order to continue the deepening of the internal market, starting with the Single European Act in 1986. Therefore, he argues, the OCA theory is exogenous to the European monetary integration process: the theory did not drive or influence the process. However, there is no doubt that the concepts and instruments developed by the OCA were used in European policy making. As an example, there is a wide European preoccupation with structural reforms which are of classical OCA theory nature such as financial integration and labour force flexibility.

From this perspective, the establishment of the nominal convergence criteria and later the EMU, although not in full accordance with the classical criteria, was made with a strong political commitment (the Maastricht Treaty) and later on, several policies implemented at EU level were in accordance with the classical criteria.. During the more recent period of economic crisis, the commitment and the functioning of the euro area has been again brought into public discussion.
2. Convergence hypothesis in neo-classical growth theory

The neoclassical growth model of Solow (1956), Cass (1965) and Koopmans (1965) demonstrate that the long term economic growth is determined by technological progress, which is an exogenous variable to the models of the mentioned authors. These models are based on some important assumptions:

- perfectly competitive economy
- decreasing returns to capital
- full use of labour force
- population and labour force grow at a constant rate

In the equation below, we define \( \gamma_k = k_t' / k_t \), representing the rate of growth for capital.

\[
(1) \quad k_t' = sk_t^\beta L_t^{a+\beta-1} - (\delta+n) k_t
\]

Starting from the equation (2) below which is a fundamental equation in growth models (Sala i Martin, 1990), and assuming constant returns to scale for work and capital (\( \alpha + \beta =1 \)) and decreasing returns to scale for capital (\( \beta <1 \)), the only steady state growth is \( \gamma_k = 0 \).

\[
(2) \quad 0 = (\beta - 1) \gamma_k + n(\alpha + \beta -1)
\]

Growth is therefore exogenous in Sollow model; economies become more productive with time. The explanation of the neo-classical economists for this phenomenon is through the effect of technology.

\[
(3) \quad Y = A(t) K_t^\beta L_t^\alpha
\]

In equation (3), \( A(t) \) is assumed to be the level of technology in the economy, which grows at a constant rate, such that \( A(t) = A(0) e^{gt} \).

Variable \( g \) represents the exogenous rate of productivity growth. In Sollow’s model, GDP per capita and capital per capita grow at rate \( g \). Later on, the term \( A(t) \) was interpreted in other ways leading to extensions of the Sollow standard model developed in the 60s.

Equation 1 with \( \alpha + \beta =1 \), a subsequent division to \( k \), and a notation \( A \) for all terms containing \( L \) leads to:

\[
(1) \quad k_t' / k_t = sA K_t^{(1-\beta)} - (\delta+n)
\]

This relationship determines the instantaneous growth rate, as a difference of two functions, and its graphical representation allows finding the steady state point, at the intersection between the two lines representing the two functions.
The growth rate for an economy starting under the steady state point is higher and decreasing. Therefore, in the case when economies differ only in the capital to labour ratio, poorer economies grow faster than rich economies. All these economies have the same steady state. This result represents the convergence hypothesis. The case explained so far is the case of **absolute convergence**, when economies differ only in terms of the capital to labour ratio.

Countries can differ in terms of savings rate $s$, depreciation rate $\delta$ or population growth rate $n$. In this case, the countries will reach different steady state points. If we consider two countries, a poor and a richer one, the poor country will converge to a smaller steady state. In this case, the poor economy grows less than the rich economy and absolute convergence is not present. There is, however, **conditional convergence**, in that each country converges to its own steady state, with a decreasing rate.

Barro and Sala i Martin (1990) confirm these two theoretical findings in empirical data. Using data from US states, they show that absolute convergence exists for these states, which have similar characteristics (technology, institution, consumption patterns). They find conditional convergence evidence in OECD countries data, as they more heterogeneous in such characteristics as institutions and technology.
3. Methods for quantifying convergence

The interest towards the theory of economic growth was revived during the 90’s, especially through papers which attempted to test the theoretical endogenous models developed in the 70’s and 80’s, but also neoclassical growth models from the 60’s. Among the most influential empirical studies is that of Mankiw, Romer and Weil, from 1992, which integrates human capital, a variable specific to the endogenous models, into the Solow model, and develops what today is called the augmented Solow model. This extension of the neo-classical model will be subsequently used by many authors to study the impact of various economic factors on long-term economic growth.

In 1999, Quah and Durlauf make an analysis of the empirical results until that moment and study the impact of various econometric models used by other authors in convergence research, in a paper which clarifies a series of methods and hypothesis used until then in convergence analysis. Contrary to the period of theoretical models of convergence, after 90’s researchers became interested in the way in which growth theory can help in the practical analysis of growth differentials between countries. In the conclusions of this paper, the authors mention that the empirical literature in the field is still in its infancy.

Although growth theory represents a vast field of economic literature, empirical studies using methods to measure convergence for the determination of the parameters of this process across countries are relatively recent and represent an actual and continuously developing field. Based on the neo-classical growth literature, empirical papers related with measuring convergence base on time series and panel data use mainly two types of methods, sigma and beta convergence.

Sigma convergence shows the extent to which convergence between countries/markets exists at a certain point in time, while beta convergence shows the speed with which countries/markets converge between them or towards a reference value. These methods were developed starting from the neoclassical convergence hypothesis, presented in the proceeding section. While sigma convergence is associated with the concept of absolute convergence in the neo-classical growth theory, beta convergence is based on the concept if conditional
convergence. However, the effective application of these methods can vary widely. For this reason, there is no consensus regarding the advantages, disadvantages, applicability and efficiency of these methods (Caliagnini et al, 2000).

From an econometric point of view, sigma convergence is measured through the time regression of the standard deviations of a variable; convergence exists when the standard deviations have a negative evolution and are close to zero. This method has the advantage that it is simple and the conclusions are obvious, but can also be inconclusive when the underlying variable is in itself a negatively evolving one, like the case of some interest rates (Adam si altii, 2002). There are authors who, trying to avoid this consequence run the regression based on correlation coefficients and not standard deviations, like Calagnini et al, (2000). The results, however, were similar to the ones obtained based on standard deviations.

Beta convergence is obtained by regressing a variable on its previous levels, and allows the possibility to extend the model by including additional other variables in the model. The method is based on the results of the growth theory showing that the growth rate of GDP per capita is negatively correlated with previous GDP per capita levels. The beta coefficient obtained shows the extent to which markets/countries converge to a common, equilibrium value of the initial variable. This method has the disadvantage that the equilibrium value is difficult to estimate or measure. As a consequence, the most common use of beta convergence is for the convergence of a variable across countries, and more rarely towards an equilibrium value.

The two methods are not substitutes for one another; they are rather complementary, because they present different information. The sigma convergence shows the degree of integration, while beta convergence shows the speed of the integration process (Durlauf, 1999).
4. Real and nominal convergence – empirical analyses on CEE countries

The convergence literature and convergence analysis are a relatively new field, which has gained in importance in connection with the situation of European emerging economies, especially countries in CEE, former communist economies before 1990's. With their accession into EU, the potential they have to reach the levels of development of western economies, and the perspective to fulfil the Maastricht criteria have become important discussion points, for which the convergence analysis plays the role of the economic fundament, both for academic papers and for economic decisions and policy strategies.

Part of these papers are concerned with the Balassa - Samuelson effect (Frankel, 2004), or the real convergence-nominal convergence tandem (Sarajevs, 2001), as well as the necessity of structural and institutional reforms. In what the accession to the euro area is concerned, much of the research analyses the impact of the nominal criteria on different macroeconomic policies, especially the monetary (Lipinska, 2008) and exchange rate (Szapary, 2000) ones, with an important emphasis on policy recommendations. A series of papers study the convergence on the European financial markets, on its different segments (Baele et al, 2004), or the degree of financial convergence in the new member states (Baltzer et al, 2008).

An empirical study on Romania and Bulgaria (Figuet, Nenovski, 2006) looke into the real, nominal and financial convergence using beta convergence. The results show that the Romanian economy is behind Bulgaria on the road to fulfilling the convergence criteria, in the context of weaker mechanism for adjustment to shocks.

Real versus nominal convergence

Despite the fact that European economic and monetary integration is primarily driven by the nominal convergence process, real convergence is a process under close scrutiny by economists, especially for new member states of the EU, whose real economy lags behind that of the rest of the Union. It is therefore important to analyze the connection between these two phenomena. One of the answers is also rooted in the neo-classical economic theory, through the Balassa – Samuelson effect (Balassa, 1964, Samuelson, 1964).

Balassa assumes an economy has two main sectors, tradables sector – producing goods that can be exported, and non-tradables sector – producing goods that cannot be exported and also
assumes the wages in the two sectors are approximately equal. A country in the catching-up process has higher productivity rates in the tradables sector, determining wage increases in this sector. Allowing for the labour force to be flexible, wage increases in the tradables sector will determine similar increases in the whole economy. Since productivity level in the non-tradables sector is lower, wage increases in the whole economy will lead to price increases for „non-tradable” goods. This way, the price level in the whole economy increases, leading to higher inflation. This is called the internal Balassa Samuelson effect, or the Baumol si Bowen (1966) effect.

Considering the exchange rate is determined by the purchasing power parity from the tradables sector, a nominal increase in the price level of the economy determines the appreciation of the currency. The external Balassa Samuelson effect compares the productivity growth differential between two sectors of activity and analyzes its effect on the real exchange rate.

The empirical literature studying and estimating the Balassa Samuelson effect is extensive and a large part of it is focused on emerging economies, especially new EU member states acceding in 2004 and 2009, due to the important role of this effect on the possibility of fulfilling the Maastricht nominal criteria. The Balassa Samuelson effect is especially concerned with the inflation rate and exchange rate criterion.

If the Balassa Samuelson effect is strong, for a fixed exchange rate scenario (e.g. the euro area), authorities have to maintain very restrictive monetary and fiscal policies, in order to achieve the price stability objective. In the euro area, this is a very difficult task, especially for the fiscal policy, for which the only instrument is the Growth and Stability Pact, which has not proven efficient in restricting member states’ fiscal policies. Additionally, restrictive monetary and fiscal policies affect the growth rate and may lead to unemployment.

In case of flexible exchange rates, a strong Balassa Samuelson effect creates the conditions for authorities to allow the real appreciation of the exchange rate, which attracts volatile capital inflows and brings prejudice to the country’s competitiveness. For EU countries not already in the euro area, this phenomenon is difficult to manage, especially if the respective country attempts to fulfil the Maastricht criteria and has at the same time the objective to reduce the development gap as compared with more developed economies.
This is one of the sources of the conflict between two objectives that a country from CEE not already in the euro area, like Romania, may have: rapid nominal convergence and entrance in the euro area, or an initial orientation towards increasing real convergence.

A series of papers have estimated the Balassa Samuelson effect based on its internal component, with various results. Rother (2000) estimates an effect between 1.00 and 4.00 for Slovenia with data between 1993 and 1998, while Halpern and Wyplosz (2001) find an effect of 3.0 for 8 candidate countries and Russia, based on data from 1991 to 1998. Also between 0 and 3.5 is Egert’s estimation (2002), with data from 1993 – 2001, but with a different estimation method: Egert uses VAR and cointegration, while the authors mentioned before use different versions of the OLS method.

Based on Egert’s method, Altar et al (2005) show that, for Romania, the increase in inflation due to the Balassa Samuelson effect was on average of 1.57 percentage points, while the real appreciation of the exchange rate due to the same effect was on average of 2.03 percentage points, for the years 1995 - 2004.

More recent studies, using more extended data sets and a higher level of detail confirm the existence of this effect in new EU member countries. Mihaljek si Klau (2008) analyze both Balassa Samuelson effects for ten CEE countries, as well as their variation in time, in order to establish if the effect diminishes in time, with the advance of the real convergence process in these countries. The domestic effect is estimated at an average of 1.1 percentage points. The international effect determines inflation increases in the euro area with an average of 1.2 percentage points. For Romania, the paper estimates a small international effect of 0.45 percentage points, but a very high internal effect, above 4 percentage points. The reduction of the effect with time generally takes place, but not in all the economies analyzed, a further proof that these economies are rather heterogeneous in what the real and nominal convergence processes are concerned.

Starting from the evidence proving that the real convergence leads to inflation increases in CEE states, Lein Rupprecht et al (2007) prove that the effects of the inflationary pressures due to the real convergence process can be diminished through a higher openness to trade, if this
takes place in a group of countries at the same time. Also, the paper confirms the high degree of heterogeneity in the CEE group.

5. Romania and the euro area – nominal and real convergence

The degree of nominal and real convergence of the Romanian economy to the euro area will be analyzed using one of the methods described in section 3, sigma convergence. For panel data the standard deviations between countries in calculated for all time periods. The series of standard deviations is regressed on a time trend, based on the following formula:

$$SD = a + bt + \epsilon$$

Convergence exists if the regression coefficient is negative, and the series of standard deviations is decreasing and approaches zero.

Nominal convergence will be assessed using four of the variables of the Maastricht criteria: inflation rate, long term government bond interest rates, government deficit and public debt, while the real convergence will be assessed based on GDP data (real GDP growth and GDP per capita). Where data is not available or insufficient for using sigma convergence, the analysis presents other relevant data, including comparison with convergence within the CEE countries group (Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia).

As presented in Putinelu (2009), in terms of nominal convergence Romania fulfilled 2 of the 4 criteria (if we do not consider exchange rate stability criterion), while in 2008 only one. The effects of the economic crisis have worsened these conclusions drawn based on data available in 2009. In terms of real convergence, the Romanian economy exhibited 45% of the EU27 GDP per capita average.

Inflation convergence
The calculations used monthly HICP index data ranging from January 1999 – March 2010. The negative regression coefficient for the case of Romania and Euro area indicates the presence of nominal convergence in inflation.
The same analysis done in the group of 12 new EU member states (including Romania) also shows the presence of inflation – based convergence within the group, since the regression coefficient is also negative. The strong decreasing tendency of the standard deviations observed in figure 2, especially between 2001 – 2007 is a sign of a homogenous evolution of inflation in these countries, towards similar level of prices. It does not necessarily mean a downward evolution of inflation itself, but rather as a proof of increase in similarity of business cycles. However, since 2007 a divergence tendency can easily be observed, triggered by the economic crisis and by the various responses that governments in CEE have achieved: some pursued inflationary policies, others, on the contrary strived to keep inflation down.
As can be seen in figure 3, there are countries like Latvia, Bulgaria, Lithuania and Estonia which reached peak crisis levels of inflation of 10 to 15%, while states like Malta, Slovakia and Cyprus registered in the same peak period maximum levels of 5%. Romania’s inflation in the peak period lies close to an average of these values, at 8%. However, the Romanian evolution of inflation in 2010, in comparison with the other CEE countries, is worse.

*Figure 3: Inflation rates in 12 CEE countries (2007 – 2010)*

![Inflation rate CEE 12](chart)

Source: author’s calculations based on Eurostat data

*Interest rate convergence*

In the calculation of interest rate convergence for the case of Romania there is an important scarcity of data: only since 2005 there are long–term bond issued regularly. The period analysed for Romania’s convergence to the euro area in terms of long-term interest rates starts with March 2005 and ends with March 2010.

The regression coefficient is not negative; therefore no sign of interest rate convergence exists. The same analysis within the group of CEE countries (excluding Estonia, where data is not available) also indicates lack of convergence, based on the sigma method.
When looking at the distribution of the actual interest rates for Romania and the euro area in figure 6, there is clear evidence that interest rates in Romania have been significantly more volatile than in the euro area, reaching a peak level of 11.5% in 2009, while the euro area exhibited a value close to 4%. Romania’s Central Bank has used interest rates to keep inflationary pressures down in a first phase of the crisis, while in a second phase has lowered them sharply in the attempt to revive credit and consumption.
Figure 6: EMU interest rates for Romania and euro area (2005-2010)

Convergence of budget deficit and public debt

Budget deficit and public debt annual data are presented for Romania and the euro area for the period 1998-2009. The fiscal criteria were among the easiest to meet for the Romanian economy before the crisis. However, even the euro area budget deficit lies well beyond the 3% limit. For Romania, the main crisis effect has been a rapid growth of the deficit, to below 8% of GDP, which will obviously put the economy well behind the nominal convergence path, at the least for a few years to come.

Figure 7: Budget deficit for Romania and the euro area (1998 – 2009)

Public debt still remains below the limit of 60% of GDP, although the IMF loan and other private sector loans contracted during the crisis period have the potential to worsen Romania’s
performance in what this criteria is concerned. Also in the context of the economic crisis, euro area debt level has reached 80% of GDP.

**Figure 8: Public debt for Romania and the euro area (1998 – 2009)**

![Public debt Romania and the euro area (1998 – 2009)](image)

Source: author’s calculations based on Eurostat data

**Real convergence**

The analysis of real convergence for Romania uses Eurostat GDP data. The dataset most suitable for sigma convergence is the quarterly GDP per capita, however for Romania the data is not available, therefore I will analyze the annual real GDP growth data available for Romania, and sigma convergence for the CEE states where quarterly GDP per capita is available.

**Figure 9: Real GDP growth rate for Romania and the euro area (2000 – 2009, 2010/2011 estimates)**


Source: author’s calculations based on Eurostat data

From 2001 to 2008, the real GDP growth for Romania has been substantially higher than that of euro area, a proof of the catching–up process in which the Romanian economy was involved. The economic crisis hit the growth rate hard enough in 2009, so as to reach lower
levels than the euro area and set back the country on the path to bridging the development gap. Eurostat forecasts regarding 2010 and 2011 are optimistic and envisage economic recovery in terms of growth rates.

The estimation of sigma convergence in the CEE group uses the data on GDP per capita during Q1 1997 – Q4 2009, for the countries where data is available (Czech Republic, Estonia, Latvia, Lithuania, Hungary, Slovenia, Slovakia). The time regression shows no evidence of real sigma convergence in this group of CEE, once more a proof of the high degree of heterogeneity within these countries.

Figure 10: GDP per capita sigma convergence in 7 CEE countries (1997-2009)

Source: author’s calculations based on Eurostat data

Conclusions

With the caution generated by the scarcity of data available for Romania and other CEE countries, the sigma convergence analysis shows that there is evidence only of inflation convergence between Romania and the euro area, as well as within the CEE group of countries. The effects of the economic crisis can be seen in the evolution of most of the variables analyzed, leading to the assumption that if the current economic downturn will continue, Romania, as well as other CEE countries will be confronted with divergence in economic evolution, within the group, as well as compared to the euro area.

For a complete picture of the real and nominal convergence with the euro area, this study should be extended with evidence of beta convergence, that will show the convergence speed, a good indicator of the perspectives to achieve nominal convergence and enter the euro area,
and real convergence, catching-up with the more developed economies in terms of GDP and other real variables.

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