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Real and Nominal Convergence in the Central and East European Accession Countries

Following their accession to the EU, which is planned for May 2004, eight central and east European countries will subsequently strive for integration into the Eurosystem. The Eurosystem underlines the need for simultaneous real and nominal convergence as a prerequisite for integration into the euro area. But some of the acceding countries argue that, at least in the short to medium term, a strengthening of nominal convergence makes real economic convergence more difficult. The following paper investigates this issue by means of an empirical study and attempts to establish to what extent real and nominal convergence are compatible.

At the European Council in Copenhagen in December 2002 the accession negotiations with eight central and east European countries were concluded. The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia are scheduled to accede to the EU in May 2004, and will subsequently strive for integration into the Eurosystem.[1] Adopting the single currency, however, will require a high degree of sustainable convergence. Pursuant to Article 121 of the EC Treaty, this requires that the Maastricht convergence criteria have to be fulfilled. In order to maintain such nominal convergence on a durable basis a sufficient amount of real convergence is also necessary.[2]

With this in mind, the Eurosystem has always called for the consistent advancement of both real and nominal convergence.[3] Underpinning this is the idea that real convergence, i.e. the convergence of per capita income, which is based on structural reforms, improves the supply side of an economy, thus promoting nominal convergence, and that stabilising monetary developments exerts a positive influence on the growth outlook of an economy. Nevertheless, some of the acceding countries argue that, at least in the short to medium term, a strengthening of nominal convergence makes real economic convergence more difficult.[4] The paper investigates this issue by means of an empirical study and tries to find out to what extent these two developments are compatible. This does not represent a formal evaluation of the progress made in convergence under the terms of the Maastricht Treaty. Rather, the aim is simply to gain an initial impression of the relationship between nominal and real convergence.

The Development of Real and Nominal Convergence

This study covers the eight central and east European countries scheduled to accede to the EU in May 2004. The observations begin with the third quarter of 1993. At that time, the initial economic slump owing to regime change had been almost overcome and at least a few of the reform countries were again posting positive growth rates. The observation period ends with the second quarter of 2002.[5]

Real convergence is measured in simple terms by the convergence of per capita income in purchasing power standards (PPS) towards the average level in the euro area. Figure 1 shows the development of per

* Deutsche Bundesbank, Frankfurt am Main. This publication represents the authors' personal opinions and does not necessarily reflect the views of the Deutsche Bundesbank.

[1] Cyprus and Malta will also accede to the EU in May 2004. However, they have been excluded from this study.

[2] This takes account of Art. 121, 1 EC, which, with regard to the convergence test, also refers to the development of the markets, the status and development of the current accounts as well as the development of unit labour costs and other price indices.

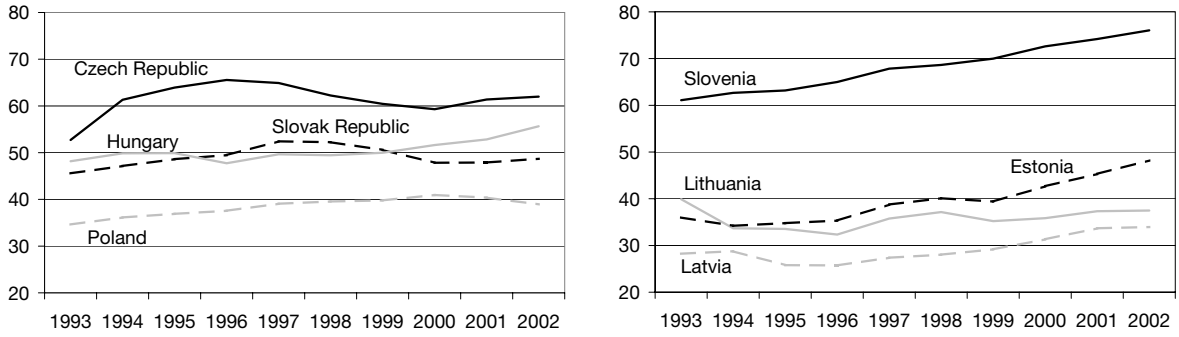
[3] See ECB: The Eurosystem's dialogue with EU accession countries, in: Monthly Bulletin, July 2002.

[4] See, in particular, Dubrovnik Conference, June 2001/2002 (http://www.hnb.hr/dub-konf/edub-konf.htm); G. Szapary: Maastricht and the Choice of Exchange Rate Regime in Transition Countries during the Run-up to EMU, NBH Working Paper 2000/7, Budapest 2002; Frankfurter Allgemeine Zeitung of 5 March 2002 and 26 February 2003.

[5] The data stems from the IMF, International Financial Statistics and from the European Commission, NewCronos database.

[6] For the period before the introduction of the euro, the data of the acceding countries are compared with the average of the founding members of EMU and Greece. The charts show annual data. However, quarterly data has been used for the subsequent calculations. The GDP data for Poland and Hungary for the period 1993-94 as well as for Slovenia for the period 1993-98 were calculated by interpolating annual data.

Figure 1
Real Convergence of the Accession Countries in 1993-2002, Measured by Per Capita Income (in PPS) as a Percentage of the Euro-area Average



capita GDP as a percentage of the euro-area average.[6]

Marked differences become apparent between the individual countries and over time. Slovenia, which, measured by population, exhibited the highest value added of all the acceding countries already in 1993, advanced by another 15 percentage points vis-à-vis the euro area during the following nine years. By contrast, the economic catching-up process in Hungary did not gain momentum until after 1999. Following initially large rates of increase the Czech Republic and the Slovak Republic have been suffering a fairly long phase of falling and/or stagnating per capita income since the second half of 1997, some of which was influenced by the Czech financial crisis. This lasted until 1999 in the Czech Republic and has still not yet been fully overcome in the Slovak Republic. At the start of the observation period, Estonia and Lithuania experienced considerable income losses. In the case of Lithuania, this meant that economic output in mid-2002 was still failing to match its initial level of the early 1990s. Whereas no clear economic catching-up process is evident yet in Poland, in Latvia, the country with the lowest income of the eight accession countries, this process started late, but has been progressing quite steadily since 1997.

A simple yardstick for the *nominal convergence* of the eight accession countries is the convergence of their inflation rates with those of the Eurosystem.[7] Figure 2 shows the inflation differentials of the acceding countries vis-à-vis the euro area. Again, the observation period stretches from Q3 1993 to Q2 2002. For the years prior to 1999, an average weighted inflation rate of the 11 founding EMU members plus Greece is used.[8]

Nominal convergence in the accession countries has also developed quite heterogeneously, especially in the first half of the observation period. In 1993, the disinflation process in some of the acceding countries was already so far advanced that the annual inflation rates were below 20% and even below 10% in the

[7] This is not a formal convergence test as defined in the EC Treaty, which would have to be geared to the three EU member countries with the best performance in terms of price stability.

[8] The figures again show annual data, whereas the subsequent calculations are based on quarterly data.

Figure 2
Nominal Convergence of the Acceding Countries in 1993-2002, Measured by Inflation Differentials vis-à-vis the Euro-area (as Percentage Points)

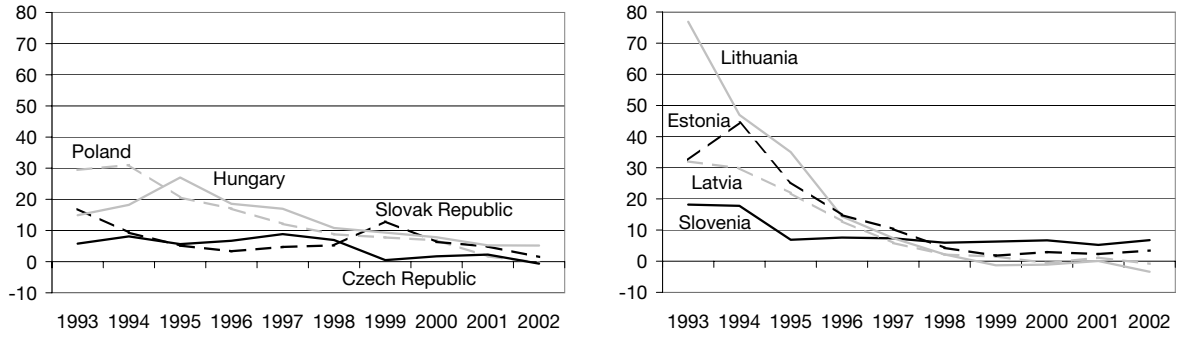


Table 1
Augmented Dickey-Fuller Test (ADF) for Stationarity of the Per Capita Income Differentials vis-à-vis the Euro Area

Country	α_i	ρ_i (t-value)
Czech Republic	-0.115	-0.244 (-2.653)*
Estonia	0.060	0.049 (1.069)
Hungary	-0.221	-0.325 (-2.034)
Latvia	-0.004	-0.008 (-0.128)
Lithuania	-0.247	-0.237 (-1.983)
Poland	-0.152	-0.163 (-1.387)
Slovak Republic	-0.136	-0.196 (-2.098)
Slovenia	0.011	-0.006 (-0.067)

* 10% significance level

Czech Republic. At the turn of 1993-94, the Baltic States had by far the highest inflation rates. Thanks, however, to their fixed exchange rates against the DM (Estonia), the US dollar (Lithuania) and IMF special drawing rights (Latvia), these countries were able to achieve significant success in stabilisation during the period that followed and are now posting inflation rates which are significantly below the average when compared with the other accession countries.

A Test for Real and Nominal Convergence

Neo-classical growth theory differentiates between two forms of convergence. The type of convergence that is relevant in this paper is known as *beta convergence*, which describes the catching-up process of economically underdeveloped countries and is defined as a convergence of the average standard of living of poorer and richer countries.[9] This concept of convergence leads to the expectation that the central and east European accession countries will show higher growth rates of per capita income over the medium term than the euro-area average.

Below, we shall examine the occurrence of beta convergence in the central and east European acceding countries using a unit root test for *real convergence*, i.e. the difference between national per capita income (y_i) and per capita income in the euro area (y_{ER}).[10] A corresponding Augmented-Dickey-Fuller Test (ADF), taking account of a constant (α_i) and centred seasonal dummies (D_k), takes the following form

$$(1)\ \Delta(y_{i,t}-y_{ER,t})=\alpha_i+\rho_i(y_{i,t-1}-y_{ER,t-1})+\sum_{j=1}^{p}\gamma_i\Delta(y_{i,t-j}-y_{ER,t-j})+\sum_{k=2}^{4}\delta_k D_k+\varepsilon_{i,t}$$

If the null hypothesis $\rho_i=0$ cannot be rejected, there is a unit root in the time series $y_{i,t} - y_{ER,t}$, i.e. the per capita incomes do not converge over time. Conversely, if ρ_i is significantly less than zero, the time series is stationary and displays stochastic convergence, which implies a convergence of per capita income.

Since accession countries, however, have started from a level of per capita income well below the euro-area average and have obviously not yet reached a steady state equilibrium, it may be difficult to differentiate this standard concept of convergence from a linear trend. A positive constant α_i indicates such a linear trend of the accession country's per capita income relative to the euro-area average and diminishes the income gap, even if unit root tests do not confirm stationarity.

Whereas ρ_i represents the speed of adjustment as a function of current income differentials and also takes account of the stability of the catching-up process after a disturbance, α_i reflects a deterministic trend in the standard of living. Below we speak of real convergence if at least one of the two conditions $\alpha_i > 0$ or $\rho_i < 0$ is fulfilled.

Even if the adjustment coefficient ρ_i is statistically significant only for the Czech Republic (10% significance level, see Table 1), the t-values for Lithuania, the Slovak Republic and Hungary also give some indication of real convergence. In Slovenia, the negative albeit not significant adjustment parameter ρ_i is accompanied by a positive deterministic trend α_i of the dependent variable, which points at a diminishing income gap as it does in the case of Estonia. In this context, however, it should be borne in mind that the t-values under H_0 (unit root of the time series $y_{i,t} - y_{ER,t}$) are not based on the t-distribution and therefore no statements can be made on the significance level of α_i. For Latvia and Poland ρ_i is also negative, but the corresponding t-values are very low.

[9] The other definition of convergence, which will not be dealt with here, requires a declining cross-country dispersion of per capita income. This so-called gamma convergence is more strongly influenced by the occurrence of asymmetrical shocks. If these shocks are relatively severe, they can obscure a trend towards income convergence for a period of time. In this case, tests for beta and gamma convergence would lead to different results. See A. B. Bernard, S. N. Durlauf: Interpreting Tests of Convergence, in: Journal of Econometrics, Vol. 71, 1996, pp. 161-173.

[10] The differences shown here are expressed as logarithmic variables. For methodology, see A. Kutan, T. Yigit: Nominal and Real Convergence within the Transition Economies and the European Union: Evidence from Panel Data, ZEI Working Paper, No. B 21, Center for European Integration Studies, Bonn 2002.

Table 2
Augmented Dickey-Fuller Test (ADF) for Stationarity of Inflation Differentials vis-à-vis the Euro Area

Country	α_i	ρ_i (t-value)
Czech Republic	1.312	-0.329 (-1.663)
Estonia	-0.024	-0.424 (-4.829)***
Hungary	-0.088	-0.193 (-2.365)
Latvia	-0.685	-0.369 (-4.704)***
Lithuania	-1.236	-0.341 (-3.356)**
Poland	-0.531	-0.345 (-2.537)
Slovak Republic	5.728	0.882 (-4.952)***
Slovenia	8.681	-1.385 (-4.807)***

* 10% significance level ** 5% significance level *** 1% significance level

Table 3
Real Compared with Nominal Convergence in the Central and East European Acceding Countries*

	Real convergence	No real convergence
Nominal convergence	1 Estonia (0.6) Hungary (0.3) Lithuania (0.2) Slovak Republic (0.3) Slovenia (0.5)	3 Latvia (0.3) Poland (0.7)
No nominal convergence	2 Czech Republic (-0.2)	4 --

*Correlation coefficients between real and nominal convergence are in brackets. For a seasonal adjustment, the individual time series were regressed to seasonal dummies and the correlation coefficients of the residuals were then calculated. (The correlation coefficients between per capita income as a percentage of the euro-area average and the inflation differentials vis-à-vis the euro area are, with the exception of the Czech Republic, all negative; this results in a positive correlation of nominal and real convergence).

In line with equation (1) the *nominal convergence* of the acceding countries can also be verified by using an ADF test on the inflation differentials vis-à-vis the euro area:

$$(2)\ \Delta(\pi_{i,t}-\pi_{ER,t})=\alpha_i+\rho_i(\pi_{i,t-1}-\pi_{ER,t-1})+\sum_{j=1}^{p}\gamma_i\Delta(\pi_{i,t-j}-\pi_{ER,t-j})+\sum_{k=2}^{4}\delta_k D_k+\varepsilon_{i,t}$$

The results are shown in Table 2. For most of the countries a high degree of nominal convergence has been confirmed. This is expressed in both a negative *deterministic trend* (α_i) of the inflation differentials and/or in significant negative values of ρ_i. It is only for the Czech Republic that the test was unable to confirm a convergence of inflation rates with the level in the euro area. This finding seems to contradict the graph in Figure 2, which shows that this country exhibited less than average inflation rates during the entire observation period. The mainly unchanged development of the time series, which is due to the low inflation rates already at the beginning of the reference period, may offer a possible explanation.

Comparison of Real and Nominal Convergence

Comparing the results of the tests for real and nominal convergence allows the countries to be broken down into four groups (see Table 3).

- The majority of countries, i.e. Estonia, Hungary, Lithuania, the Slovak Republic and Slovenia, seem to converge in both real and nominal terms vis-à-vis the euro area (field 1). This finding indicates that, if there is any causality at all, a positive relationship exists between the two processes. At least, it suggests that nominal convergence does not essentially impede the progress of real convergence.
- Although the Czech Republic appears to be showing real convergence with the euro area, empirical tests for nominal convergence produced no evidence of convergence of the inflation rates (field 2). Nonetheless, this country did have comparably low inflation rates during the entire observation period, which means that a stable monetary environment may be assumed here as well.
- By contrast, although Latvia and Poland are showing nominal convergence with the euro area, a convergence in the standards of living cannot be detected with any certainty over the observation period as a whole (field 3). The hypothesis presented at the beginning of the study – that nominal convergence hinders the development of real convergence – cannot be rejected outright for these countries.
- Finally, on a positive note, all of the acceding countries under consideration show at least real or nominal convergence vis-à-vis the euro area. Field 4, in which there would be no identifiable economic convergence with the euro area, remains blank.

In line with the results described above, those countries that show some degree of both real and nominal convergence vis-à-vis the euro area, also show a positive correlation of real and nominal convergence. Strikingly, Poland shows the highest correlation coefficient of all the acceding countries, despite a lack of reliable real convergence. In Latvia, where the tests for real and nominal convergence produced no uniform

results either, the relevant correlation is also positive, albeit small. Only for the Czech Republic does a negative correlation coefficient seem to give some support to the hypothesis of a trade-off between monetary stability and economic growth, at least in the short term. The value of the correlation efficient is, however, extremely small and thus not very informative. All in all, the claim that a stability-oriented monetary policy may hinder the economic catching-up process cannot be confirmed.

However, it should be pointed out that the existence of a positive correlation between real and nominal convergence does not permit any inferences to be drawn with regard to a causal connection between the two processes. Indeed, monetary and real economic convergence may be the joint outcome of a generally consistent economic policy. In this connection, it is striking that it is precisely those countries showing both real and nominal convergence which received particularly good assessments in the most recent European Commission reports on the progress made by the individual acceding countries.

Conclusion

On the whole, greater nominal convergence as defined in this paper does not seem to be an obstacle to simultaneous success in real economic convergence. On the contrary, in seven of the eight accession countries considered in this paper, a positive (albeit not ubiquitously strong) correlation between nominal and real convergence can be observed. This supports the view of the Eurosystem, which underlines the need for *simultaneous* real and nominal convergence as a prerequisite for the integration of the central and east European economies into the euro area. Exercising all due caution owing to the low statistical significance level of some coefficients, the results furthermore indicate that these are parallel and mutually reinforcing processes. At the same time, the results make clear that the progress of the accession countries with respect to real convergence is clearly lagging behind monetary stabilisation. Therefore, before entry into monetary union, further convergence of the real economic conditions in the individual accession countries with those of the euro area would appear necessary. Also, it should be pointed out that nominal convergence, as defined in the Maastricht Treaty, encompasses more than the reduction and convergence of inflation rates. Along with the convergence of long-term interest rates and the stabilisation of exchange rates under ERM II, sustainably sound public finances are a major precondition for entry into monetary union.