Convergence of Candidate Countries to the European Union

By

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Abstract

Ten European Union (EU) candidate countries are scheduled to join the Union by 2004. A key requirement to join the Economic and Monetary Union is real and financial convergence to EU standards. Using recent panel unit root techniques, we find strong evidence of price level convergence, but not real convergence. Thus, an early peg to the Euro and a quick adoption of the Euro as a national currency is feasible for the candidates, but the benefits of joining the Euro zone are as yet limited.

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I. Introduction

A key goal of transition economies of Central and Eastern Europe and the Baltic States to join the European Economic and Monetary Union (EMU), after entering the European Union (EU). Most recently, ten candidate countries are scheduled to join the Union by early 2004. These countries include Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, and Slovenia. To the extent that countries display similar economic performance over time and gear policies towards EU standards, we expect more real and financial convergence in macroeconomic fundamentals towards the EU as the impact of initial conditions decline over time. The signing of the Copenhagen and Maastricht Treaties indicates that Europe supports a parallel approach in that both real and nominal convergence is emphasized simultaneously. This paper tests whether such convergence is achieved between the ten candidate countries and the EU.

There are limited studies that investigate the issue of convergence of candidate economies to EU standards (Brada and Kutan, 2001; Korhonen and Fidrmuc, 2001; Richards and Tersman, 1996; Backé et al., 2002). While most of these papers do not provide comprehensive evidence on convergence either in terms of country coverage or the type of convergence (real versus nominal) to the EU standards[1], one needs to note their reliance on time series data methodology with fairly small datasets. Some studies cover leading transition economies, while others focus only on selected candidate

[1] Kočenda (2001) and Kutan and Yigit (2003) focus on real and economic convergence, but only among transition economies, not convergence of these economies to those of the EU.

countries. On the other hand, some work focuses on nominal convergence, while others study only real convergence of transition economies to EU standards.

In this paper, we execute a comprehensive study that covers all the 10 candidate countries and examine both nominal and real economic convergence. We also employ a set of panel approaches that not only allows us to test convergence much more reliably than by just using time series evidence, but also help us maintain the assumption of cross country differences. In the next section, we describe our panel methodologies. Section III explains our data and reports the empirical findings. Section IV discusses the policy implications of our findings and concludes the paper.

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II. Methodology

In the past decade, a wide variety of empirical work on neoclassical growth model was undertaken. One branch of these studies has utilized time series methodology to test for the key proposition of convergence hypothesis. Based on mostly unit root tests, these papers focus on capturing the persistence of shocks relative to per capita incomes.[2] Such (stochastic) convergence applies, if per capita income disparities between economies follow a mean-stationary process, i.e. relative per capita income shocks lead to transitory deviations from any tendency toward convergence.

Recently, panel unit root tests have been adopted to address the low power associated with univariate tests, increasing the power by the square root of the cross sectional units when testing for convergence. Some (certainly not all) tests include Quah (1992), Levin, Lin and Chu (2002), Maddala and Wu (1999), Hadri (2000), and Im,

[2] Earlier papers concentrated on the notions of β convergence (where poor countries grow faster than rich ones) and σ convergence (where income variance between poor and rich countries is diminishing). Our

Pesaran and Shin (IPS, 2003). In this paper, we focus on the last two due to their superior size and power properties and their permission for heterogeneity of cross sectional units within the panel.

The Im, Pesaran and Shin (2003) test improves the power of the univariate Augmented Dickey-Fuller procedures

$$\Delta\left(y_{i,t}-\overline{y}_t\right)=\delta_i+\rho_i\left(y_{i,t-1}-\overline{y}_{t-1}\right)+\sum_{k=1}^{p}\phi_{i,k}\Delta\left(y_{i,t-k}-\overline{y}_{t-k}\right)+u_{i,t} \tag{1}$$

where $y_{i,t}-\overline{y}_t$ is the income disparity from mean output (or benchmark economy) of i = 1,..,N countries at time t. Their method pools N separate independent ADF regressions, in which values of ρ_i less than 1 indicate that disparity from the mean is decreasing with time. Testing $H_0:\rho_i=0$ (the null of unit root) for all i against $H_A:\rho_i<0$ for at least one i, they show that the limiting distribution for their t-statistic is given as:

$$\sqrt{\mathrm{N}}\frac{\left(\overline{t}_{ADF}-\mu_{ADF}\right)}{\sqrt{\sigma^2_{ADF}}}\rightarrow N(0,1) \tag{2}$$

where the moments μ_{ADF} and σ^2_{ADF} are obtained from Monte Carlo simulations, and $\overline{t}_{ADF}$ is the average estimated ADF t-statistics from the sample. Their simulations show that the power of the tests should increase by $\sqrt{N}$ when compared with univariate models.

An important assumption of the IPS technique is the *iid* error structure. When this assumption is violated and residuals are contemporaneously correlated, Maddala and Wu (1999) and Strauss and Yigit (2003) show that this technique will suffer from significant size distortions, which do not disappear by simple demeaning. Therefore, for the

analysis concentrates on stochastic convergence, which does not necessitate each country to converge to the same steady state.

remaining part of the paper we make size adjustments by deriving new critical values for the IPS test.

Next, we utilize a test that has the null of stationarity rather than that of the unit root. Since it is well known that panel tests with the null of unit roots might not be very powerful against relevant alternatives, we utilize the Hadri (1999, 2000) stationarity test to check for real and nominal convergence. Building on a model

$$\begin{aligned} y_{it} &= r_{it} + \varepsilon_{it} \\ r_{it} &= r_{it-1} + u_{it} \end{aligned} \tag{3}$$

and testing $H_0 : \sigma_{u1}^2 = \sigma_{u2}^2 = ... = 0$ vs. the alternative $\sigma_{ui}^2 > 0$ for some *i*, they show that their one-sided LM statistic

$$LM = \frac{1}{N} \sum_{i=1}^{N} \left(\frac{\frac{1}{T^2} \sum_{t=1}^{T} S_{it}}{\hat{\sigma}_{\varepsilon i}^2} \right) \tag{4}$$

where S_{it} is the partial sum of residuals, $S_{it} = \sum_{j=1}^{t} \hat{\varepsilon}_{ij}$, asymptotically has a normal distribution. Their simulations show good size and power of this test, especially when *T* is above 50. Monte Carlo simulations not reported in our paper show that the Hadri test is less prone to size distortions that are caused by contemporaneous correlation.

III. Data and Results

We use monthly data from 1993:01 to 2001:12 to test for convergence in *annual growth rates* in monthly output (industrial production), price (PPI and CPI), and nominal and real interest rate spreads[3] series for the 10 countries chosen as the first round

[3] Spread is measured by the difference between lending and deposit rates. Real spread is constructed by subtracting inflation from the nominal spread.

candidates for EU membership[4]. Germany is used as the benchmark economy representing the EU standards. The data used in estimations are obtained from *International Financial Statistics* of the IMF. Descriptive statistics are reported in Table 1.

In this paper, real convergence is measured by the industrial production variable. Analysis of nominal convergence starts with tests of monetary policy convergence. Although some studies use monetary aggregates (e.g., Brada and Kutan, 2001), we use interest rate spreads to measure monetary convergence because changes in nominal lending and interest rates directly affect demand and time deposits and thus the composition of money supply. Hence, changes in monetary aggregates reflect more policy outcomes than actual implementation of the policy. Another part of the tests for nominal convergence is the analysis of the CPI and PPI. They not only reflect monetary policy outcomes, but also the trade linkages between sample countries.

Table 2 reports the IPS results and the progress made by the candidate economies as to their convergence to EU economic standards. As mentioned above, we generated new critical values using Monte Carlo simulations to correct for the size distortions that arise due to cross-correlation between the candidate countries (Table 3). We use the correlation matrix of the sample countries and 3000 iterations to derive the critical values for the mean and variance of the IPS t-bar statistic. Then we use these critical values to derive the z-statistic of the average (Table 2).

Looking at the results for the industrial production, we observe significant real convergence. When we look at the findings for price level convergence, we seem to have

[4] Again, these are Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, and Slovenia.

strong convergence in both the CPI (at 99%) and the PPI (at 95%). Assuming that PPI linkages reflect more trade relationships, while CPI linkages capture more monetary policy outcomes, the finding of convergence in both the PPI than the CPI indicates that trade linkages have been as strong as monetary policy linkages. In other words, the candidate countries have adhered to EU monetary policy and targeted stronger trade relationship with the EU. The former is further confirmed by significant convergence in monetary policy, given by interest rate spreads.

Examination of Hadri test results (Table 4) tells quite a different story, however. Concentrating on the Newey-West (1994) and Andrews-Monahan (1992) estimates of long run variance, as suggested by the author, we note that only the CPI and PPI price series fail to reject stationarity. The interpretation of our conflicting results likely lies in the averaging nature of both statistics. Since both statistics average individual statistics across *N*, the outliers in each test that are 'very' stationary (for IPS) or 'very' non-stationary (for Hadri) are the determining factors. More importantly, the results indicate that inferences on convergence are sensitive to econometric methodology employed.

Comparing the IPS and Hadri tests results, we find strong evidence of price level convergence. However, it is hard to make more definite inferences about monetary policy or real convergence as both tests provide conflicting results. Because both the CPI and PPI not only reflect monetary policy outcomes, but also the trade linkages between sample countries, finding no monetary policy convergence indicates that the candidate countries pursued strong trade linkages with the EU. Indeed, data show growing trade relations between the EU and candidate countries during 1990s and early 2000s.

IV. Policy Implications and Conclusion

We have tested real and monetary stochastic convergence of the ten EU candidate economies to the EU standards, using macroeconomic data from January 1993 to December 2001. Evidence indicates that the EU candidates have made significant progress in price level convergence with respect to EU, suggesting that these countries are satisfying the Maastricht conditions only partially. Strong price level convergence suggests significant trade linkages between the EU and candidate countries. Evidence on monetary policy convergence and real convergence is not as strong as the price level convergence, however.

Lack of real economic convergence suggests that candidate countries' supply and demand shocks may not be closely correlated with those of the EU members, indicating high costs of following Euro-zone wide policies. Thus, an early adoption of the Euro as a national currency would not be welfare enhancing for the candidate countries if such high costs due to reduced policy autonomy more than outweigh the benefits of reduced transactions costs by adopting the Euro. Hence, the accession countries need to evaluate the timing of their commitments to the Euro, and this may delay entering the Euro zone. The growing trade linkage should help the accession countries promote further real convergence over time. The candidate countries should therefore continue to foster trade relationships with the EU. On the methodology side, our results indicate the sensitivity of convergence inferences to different econometric specifications. Given the fact there is no commonly used methods of estimating convergence, this issue needs further scrutiny.

References

Andrews, D.W.K. & J.C. Monahan. "An Improved Heteroskedasticity and Autocorrelation Consistent Covariance Matrix Estimator", *Econometrica,* 1992, Vol. 60, 953-966.

Backè, Peter, Fidrmuc, Jarko, Reininger, Thomas and Schardax, Franz. "Price Dynamics in Central and Eastern European EU Accession Countries", Working Paper No. 61, Oesterreichische Nationalbank, February 2002.

Brada, Josef C. and Kutan, Ali M. "The Convergence of Monetary Policy between Candidate Countries and the European Union", *Economic Systems*, Vol. 25, No. 3, September 2001, pp. 215-231.

Hadri, K. "Testing for Stationarity in Heterogeneous Panel Data" *Econometrics Journal*, 2000, Vol. 3(2); pp. 148-161.

Hadri, K. "Testing for Stationarity in Heterogenous Panel Data with Serially Correlated Errors" University of Liverpool Research Papers in Economics, Finance and Accounting, 1999/04.

Im, K. S., Pesaran, M. H. and Y. Shin. "Testing for Unit Roots in Heterogeneous Panels" *Journal of Econometrics* July 2003, 115(1); pp. 53-74.

Kutan, Ali and Taner Yigit. "Nominal and Real Stochastic Convergence of Transition Economies, 2003, forthcoming in *Journal of Comparative Economics*.

Kočenda, Evžen. "Macroeconomic Convergence in Transition Economies", *Journal of Comparative Economics*, Vol. 29, No. 1, March 2001, pp. 1-23.

Korhonen, Iikka and Fidrmuc, Jarko. "Similarity of Supply and Demand Shocks between the Euro Area and the Accession Countries", *Focus on Transition*, No.2, 2001, pp. 26-42.

Levin, Andrew; Chien-Fu Lin; and Chia-Shang J. Chu. "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties" *Journal of Econometrics*, May 2002, 108(1); pp. 1-24.

Maddala, G. S.and S. Wu, "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test**"** *Oxford Bulletin of Economics and Statistics*, Special Issue Nov. 1999, v. 61, iss. 0, pp. 631-52

Newey, W.K. & K.D. West. "Automatic lag selection in covariance matrix estimation", *Review of Economic Studies*, 1994, Vol. 61, 631-653.

Quah, D. “International Patterns of Growth: Persistence in Cross-Country Disparities”, unpublished manuscript, London School of Economics, 1992.

Richards, Anthony J. and Tersman, Gunnar H.R. “Growth, Nontradables, and Price Convergence in the Baltics”, *Journal of Comparative Economics*, Vol. 23, No. 2, October 1996, pp. 121-145.

Strauss, J. and T. M. Yigit. “Shortfalls of Panel Unit Root Testing” *Economics Letters,* Vol 81(3), December 2003, Pages 309-313.

Table 1: Descriptive Statistics of Percentage Growth Rates: Averages (Standard deviations)

	Industrial Production	*PPI*	*CPI*	*Nominal Spread*	*Real Spread*
Cyprus	0.02 (36.0)	2.97 (4.8)	3.13 (1.7)	2.31 (0.5)	-0.83 (1.7)
Czech	4.96 (8.6)	4.08 (2.1)	7.29 (3.0)	1.83(0.1)	1.00(0.7)
Estonia	4.25 (15.7)	11.86 (10.8)	11.86 (10.8)	2.25(0.4)	1.04(0.8)
Hungary	9.59 (7.3)	14.40 (6.7)	16.05 (5.6)	1.29(0.1)	0.33(0.1)
Latvia	7.21 (20.0)	12.45 (10.4)	4.50 (6.1)	2.44(0.5)	2.22(1.2)
Lithuania	-2.06 (22.4)	31.11 (47.3)	34.68 (59.9)	1.69(0.5)	4.71(13.6)
Malta	NA	NA	3.00 (1.1)	3.21 (0.36)	0.20 (1.0)
Poland	5.06 (9.2)	13.31 (7.8)	16.25 (7.7)	1.23(0.2)	0.39(0.3)
Slovak	3.61 (4.9)	8.80 (3.2)	6.12 (3.4)	1.55(0.2)	0.74(0.3)
Slovenia	2.96 (4.2)	8.02 (4.6)	10.42 (3.7)	1.54(0.1)	0.82(0.2)

Note: NA means data not available.

Table 2: IPS Results for the First-Round Countries

	Industrial Production♠	*PPI*♠	*CPI*	*Nominal Spread.*	*Real Spread*♠
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Cyprus	0.44	0.74	0.72	0.84	0.76
Czech	0.72	0.89	0.92	0.83	0.90
Estonia	0.79	0.91	0.84	0.77	0.75
Hungary	0.53	0.97	0.96	0.83	0.94
Latvia	0.77	0.88	0.76	0.51	0.62
Lithuania	0.83	0.92	0.84	0.50	0.85
Malta	NA	NA	0.77	0.94	0.75
Poland	0.87	0.90	0.90	0.89	0.95
Slovak	0.61	0.80	0.91	0.63	0.79
Slovenia	0.76	0.95	0.95	0.89	0.85
t-ave.	-2.73	-2.77	-3.53	-3.08	-4.64
z-stat.	4.30***	-2.25**	-5.92***	-3.84***	-13.36***

Note: NA means data not available. ** (***) indicates significance at 95% (99%) confidence level. Z-statistics are derived using the critical values reported in Table 3.

♠ A trend term was included in the regression.

Table 3: Moments of the IPS t-bar statistic, simulated under the consideration of cross-correlations within groups

	Industrial Production	*PPI*♠	*CPI*♠	*Nominal Spread*♠	*Real Spread*♠
Mean	-1.51	-2.19	-2.17	-2.17	-0.16
Variance	0.72	0.59	0.53	0.56	1.12

♠ A trend term was included in the simulations to derive the above critical values.

Table 4: Hadri (2000) stationarity test results on convergence to the EU.

	N	*T*	*LM with A-M*	*LM with N-W*
CPI	10	98	2.44**	0.07
Industrial Prod.♠	9	102	5.48**	4.28**
PPI♠	9	102	-0.38	-1.01
Nominal Spread	10	104	3.72**	2.98**
Real Spread♠	10	105	2.30**	2.58**

Note: LM with A-M refers to the LM statistic obtained using the Andrews_& Monahan (1992) long run variance estimator while N-W refers to Newey-West (1994). We reject the null at 5% if the one-sided statistic is greater than 1.645. Sample sizes vary due to the truncation necessary to supply a balanced panel.

♠ Stationarity was tested around a deterministic trend.