Do the new EU member states form an Optimum Currency Area with the eurozone? Evidence from six Central and Eastern European Countries

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Abstract: The present paper examines whether six of the new European Union member states -the six Central and Eastern European Countries- form an optimum currency area (OCA) with the eurozone. The study applies the theory of Generalized Purchasing Power Parity, which analyses the behavior of the long-run real exchange rates of a group of economies with respect to a base currency. The findings indicate that the six countries form an OCA with the eurozone for the period following the introduction of the euro.

Keywords: EU enlargement; OCA; real exchange rates; cointegration; GPPP.

JEL Code: C32; F33; F36; F42.

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1. Introduction

Since May 2004, twelve new countries have joined the European Union. Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia joined the EU in May 2004; Bulgaria and Romania in January 2007. The twelve new member states (NMS) are now participating in the single European market with free exchange of goods and services and free movement of capital. At present, eight of the NMS have a currency other than the euro – the three Baltic countries and five Central and Eastern European Countries. However, all of these countries are required by their Accession Treaties to join the eurozone and thus they have turned their attention to the next step in their integration with Europe: replacing their national currencies with the euro. Thus, at some future date the eight countries will share a common currency and monetary policy with that of the euro area, which can be considered as the only real world approximation of an optimal currency area (OCA) in the sense defined by Mundell (1961). The question that naturally arises is: to which extent are the NMS aligned with the eurozone, or, in other words, do they constitute an OCA with the rest of the eurozone members? The main objective of the present study is to investigate this issue, thus contributing to the existing empirical literature on the assessment of the alignment of the NMS with the eurozone. The study focuses on the six Central and Eastern European Countries (CEEC6): Bulgaria, the Czech Republic, Hungary, Poland and Romania, which now operate independent monetary policies and have some way before they achieve policy convergence with the euro area (see, *inter alia*, Schadler *et al*., 2005); the Slovak Republic is also included in the group of the countries under examination, given that it adopted the euro recently – in January 2009.

The theoretical literature on OCA does not provide any formal criterion to evaluate whether timing of implementation of a currency can be considered optimal (Eichengreen, 1990). However, in the relevant empirical literature, two main approaches have been used to evaluate whether or not a group of countries constitute an OCA. The first approach is based on the theory of the Generalized Purchasing Power Parity (GPPP) and was introduced by Enders and Hurn (1994). This approach analyses the behavior of the real exchange rates of the economies with respect to a base currency. The second approach is introduced by Bayoumi and Eichengreen (1998). It advocates the construction of an index which is based on the forecasted values of exchange rate variability, assuming that the exchange rate is determined by economic fundamental variables. To date, there is one paper by Horvath (2007) which has examined if the CEEC6 form an OCA, using the Bayoumi and Eichengreen index for the period following the introduction of the euro in 1999. It indicates that the six NMS are relatively well aligned with the euro area for the years 1999-2004.

In the present paper we extend this literature by applying the first approach, the theory of GPPP, to assess the potential for an OCA of the CEEC6 economies with the eurozone. The GPPP theory proposes testing whether the real exchange rates of a group of economies with respect to a base currency form a cointegrating vector or not. The theory is based on the following idea: it could be that the real exchange rates of a number of economies are not themselves stationary, as a result of the non stationarity of the fundamental economic variables; nevertheless, if the fundamentals are sufficiently integrated as in a currency area, the real exchange rates will share common trends and, therefore, will form a cointegrating relationship. In the study, we use data since the start of the transition phase of the six economies at the beginning of the 1990s. In order to make use of all available observations, we

approximate the eurozone by Germany given that Germany has been the reference country for all European countries during the pre-euro years of the European Monetary System and its central bank pursued an anti-inflationary monetary policy similar to that pursued by the European Central Bank. Besides, Germany still weights for roughly one-third of the euro area GDP.[1]

An additional issue of interest is whether the introduction of the euro and the decision of the six NMS to join the euro area have facilitated their route towards the formation of an OCA with the eurozone. Experience with the first wave of euro area participants has shown that some of the conditions for a successful currency area are endogenous (Frankel and Rose, 1998): Trade openness, which is a condition for participation in an OCA, may be influenced by participation in an OCA. In addition, a common currency may promote trade, growth and economic and financial integration. Hence, the OCA endogeneity theory supports that countries joining a currency union may satisfy the criteria of an OCA ex post, even if they do not ex ante.[2] In the present study we extend this idea and claim that the decision to participate in a currency area and the policy measures that follow such a decision may enhance the economic integration of the participants. To analyze the effects of the introduction of the single currency and the decision of the CEEC6 to join the European Monetary Union, we also test for GPPP for the recent period following the introduction of the euro in January 1999.

The empirical work entails univariate stationarity analysis of the individual real exchange rate series and then testing for cointegration in a multivariate setting. To this end, we apply the Johansen technique (Johansen, 1995) and the cointegration tests developed by Saikkonen and Lutkepohl (2000a, b). The model specification used for cointegration allows for different long-run relations and short-run dynamics. As evidenced in the relevant literature, if the short-run dynamics are different from the long-run relations, the specification of the short-run dynamics turns out to be crucial for the estimation of the equilibrium relationships.

The rest of the paper is organized as follows. Section II presents briefly a review of the GPPP theory and its relevance to the OCA theory. Section III presents the empirical results. The final section summarizes and concludes.

2. The economic background

The GPPP theory is based on the following idea: It could be that the fundamental economic variables determining real exchange rates of a group of economies are non-stationary, and consequently the real exchange rates of the economies are non-stationary. However, the fundamental variables can still be sufficiently integrated; in such an event, the real rates will share common trends and form a cointegrating relationship (Enders and Hurn, 1994). If this holds true, the economies constitute an optimal currency area in the sense of Mundell (1961) who argues that two economies constitute a currency area if they present similar real disturbances. Following this rationale, the existence of an

[1] A number of empirical studies use Germany as the base country of the European Union; see inter alia Antonucci and Girardi, 2006.

[2] On the other hand, an opposite view states that economic integration creates incentives to exploit economies of scale, resulting in greater exposure to asymmetric shocks (Krugman and Venables, 1996).

equilibrium path for a linear combination of real exchange rates rules out the presence of real asymmetries and implies long-run sustainability of a monetary area.

The theory also suggests that, when economic interdependence in a group of economies is high, an economy's bilateral real exchange rate is influenced by the exchange rates of the other economies in the group and the fundamentals of the other economies. The theory thus questions the validity of the standard bilateral tests for the validity of the Purchasing Power Parity (PPP) hypothesis as they ignore the influence that outside countries may have on bilateral exchange rates.[3]

Following the notation of Enders and Hurn (1994), GPPP can be described as follows: given an *n*-country world, an *m*-country ($m \leq n$) currency area exists such that a long-run equilibrium relationship exists between the m - 1 bilateral exchange rates, of the form:

$$r_{21t} = a + b_{31t}\, r_{31t} + b_{41t}\, r_{41t} + b_{51t}\, r_{51t} + \ldots\ldots + b_{m1t}\, r_{m1t} + e_t \quad (1)$$

where r_{i1t} is the log of the bilateral real exchange rate in period t between country 1 and country i; a is the intercept term; b_{i1}s are the parameters of the cointegrating vector, which represent the degree of comovement of the real exchange rates; and e_t is a stationary stochastic disturbance term.

It is clear that if all b_{i1}s are equal to zero, then the traditional PPP -between countries 1 and 2- is valid. GPPP holds when the combination of the non-stationary bilateral real exchange rates is shown to be itself stationary. The b_{i1} parameters reflect the economic interdependencies within the group of economies. Enders and Hurn (1994) show that the estimated b_{i1}s are closely linked to the aggregate demand functions of a goods market-clearing relationship. They also indicate that the more similar the aggregate demand functions in each country of the group, the lower the b_{i1}s in magnitude.

The GPPP method has been used in a number of papers, in order to test whether a group of countries form an OCA or not and, consequently, whether a group of economies, considered as a whole, is suitable for monetary integration. In particular: Enders and Hurn (1994) test for GPPP using the exchange rates of a group which includes industrialized countries and countries of the Pacific Rim. Sarno (1997) tests for cointegration of the real exchange rates of a number of EMS countries for the period before the introduction of the euro. Bernstein (2000) assesses cointegration of the real exchange rates of a group of European countries. Antonucci and Girardi (2006) use the real exchange rates of eleven EMU countries and examine the effects of structural changes on the behavior of the real exchange rates. Wilson and Choy (2007), Ahn *et al.* (2006), Kawasaki and Ogawa (2006), Choudry (2005), Ogawa and Kawasaki (2003) and Aggarwal and Mougoue (1993) use the concept of GPPP in order to provide insights on whether East Asian countries should proceed to a monetary union. Neves et al. (2007) examine whether the Mercosur economies form an optimum currency area.

[3] The idea that third country effects should be taken into account when testing for bilateral PPP is further developed in Sideris (2006a).

3. The empirical evidence

3.1 The data set

The econometric work entails initially univariate analysis of the real exchange rate series.[4] In other words, we first test for stationarity of the series, applying a set of unit root tests. Then, and in the event that the real exchange rates turn out to be non stationary, we test whether there holds a GPPP relationship among them, using the concept of cointegration.

In the study we use monthly observations for the domestic currencies of the six countries against the German mark. The price variables are measured by the consumer price index (CPI), given that CPIs are the indices published for all involved countries and are broadly similar as far as coverage is concerned. The sample period varies in the different economies, depending on the period when the reforms started and the availability of the data. Reforms started in 1990 in all six countries but data observations are available for the period after 1993 for the Czech and Slovak republics. All data are taken from the International Financial Statistics electronic database. Effective estimation periods are reduced so as to accommodate the lag structure of the estimated models. To investigate any possible effects coming from the introduction of the euro, analysis is performed for the whole period 1993.1-2007.12, and for the post-euro period 1999.1-2007.12.

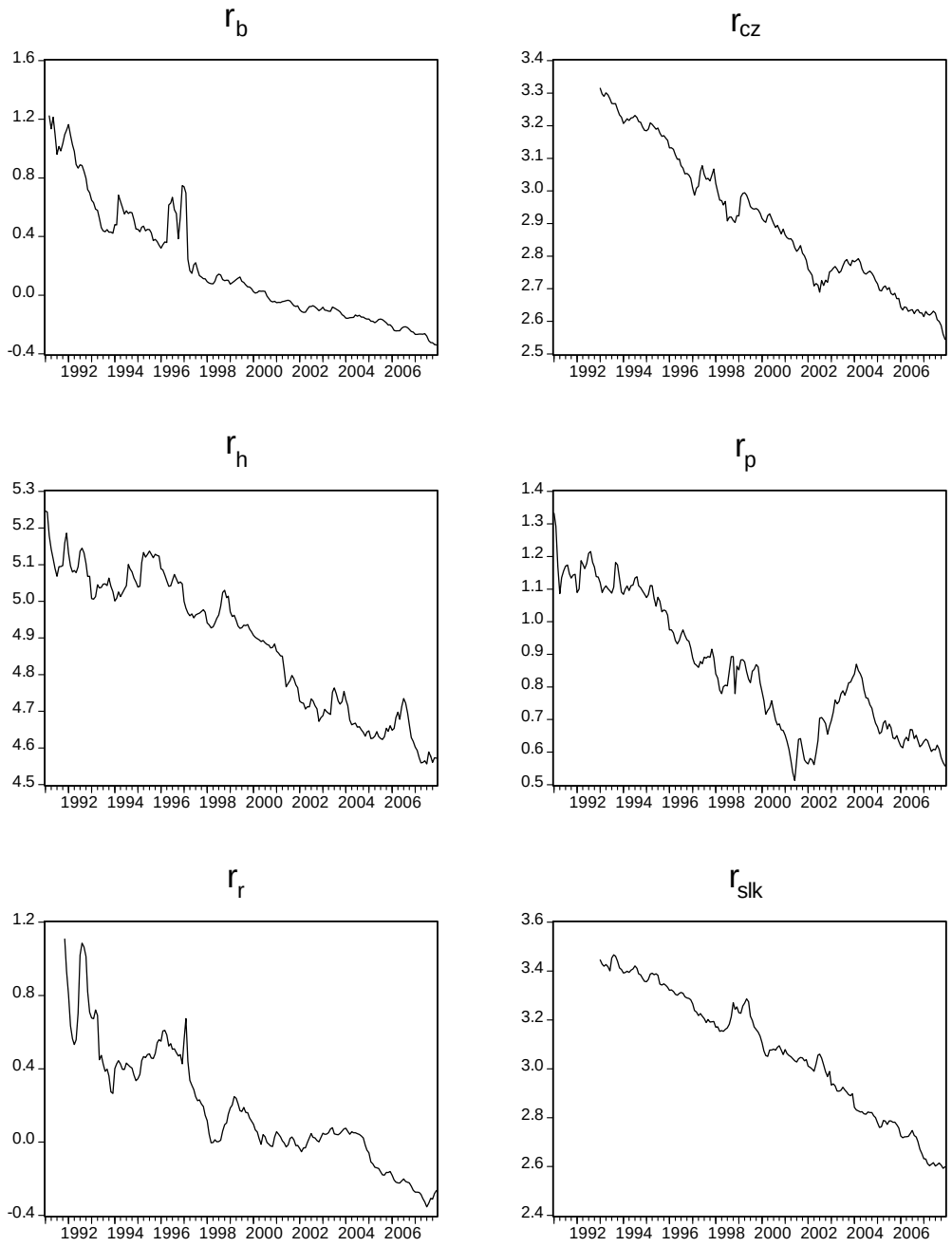
3.2 Univariate analysis- Unit root tests

Time series plots of the six real exchange rate series vis-à-vis the German mark are given in Figure 1. The real exchange rate series are denoted as r_i; the subscript i takes the values *b, cz, h, p, r* and *slk*, which stand for Bulgaria, the Czech Republic, Hungary, Poland, Romania and the Slovak Republic, respectively. The series exhibit trending behaviour and provide evidence against mean-reversion. The time plots also indicate that time changes may exist in the drift of the corresponding series. As indicated in the plots, the volatility of the rates is quite high for most of the currencies – mainly the currencies of Bulgaria, the Czech Republic and Romania- in the period until 1999 and declines after 2000, possibly also as a result of pegs.

[4] Analysis of the behavior of the real exchange rates is essential in the international economics literature. Stationarity of a bilateral real exchange rate implies that PPP holds between the two economies, evidence which, in turn, indicates that the two economies are well integrated. The real exchange rate offers also a measure of competitiveness between the two countries and can provide an equilibrium value for the nominal exchange rate.

Chart 1

The real exchange rates



We apply two different sets of unit root tests. The first set entails standard ADF tests, whereas the second set analyses the unit root properties after taking into account possible structural shifts in the series. The results of the ADF tests for the six real exchange rate series are reported in Table 1, Panel A. In the regressions of the series, we include a constant, a trend and seasonal dummies, based on tests for their statistical significance. No trend appears in the tests for the first differences. Given that the lag length is known to have an impact on the results of the unit root tests, we perform tests with different lag lengths as suggested by different lag selection criteria. The maximum lag length is set equal to 12. Overall the ADF test results provide evidence for a unit root in all real exchange rate series. The results imply that there is no PPP between Germany and any of the economies under consideration during the period under consideration.

Table 1

Unit root tests

Panel A: Augmented Dickey-Fuller tests							
Var.	Lags		Det. terms	Test statistic	Critical values		
					10%	5%	1%
rb	**AIC:**	**7**	**c, t, SD**	**-3.36**	**-3.13**	**-3.41**	**-3.96**
	HQ, SBC:	3	*c, t, SD*	-2.81			
r_{cz}	AIC, HQ:	1	*c, t, SD*	-2.71			
	SBC:	0	*c, t, SD*	-2.49			
r_h	AIC, HQ, SBC:	1	*c, t, SD*	-3.13			
r_p	AIC, HQ:	1	*c, SD*	-1.10	-2.57	-2.86	-3.43
	SBC:	0	*c, SD*	-1.17			
r_r	AIC, HQ:	3	*c, t, SD*	-3.02	-3.13	-3.41	-3.96
	SBC:	2	*c, t, SD*	-2.71			
r_{slk}	AIC, HQ, SBC:	1	*c, t, SD*	-2.81			
Δr_b	AIC, HQ:	4	*c, SD*	-9.30	-2.57	-2.86	-3.43
	SBC:	2	*c, SD*	-8.64			
Δr_{cz}	AIC, HQ, SBC:	0	*c, SD*	-7.03			
Δr_h	AIC:	1	*c, SD*	-9.01			
	HQ, SBC:	0	*c, SD*	-10.1			
Δr_p	AIC, HQ, SBC:	0	*c, SD*	-11.2			
Δr_r	AIC:	2	*c, SD*	-6.72			
	HQ, SBC:	1	*c, SD*	-9.91			
Δr_{slk}	AIC, HQ, SBC:	0	*c, SD*	-10.9			

Panel B : Unit root tests allowing for structural breaks								
Var.	Lags		Det. terms	Possible break	Test statistic	Critical values		
						10%	5%	1%
r_b	AIC, HQ:	4	*c, SD*	1997M3	-0.42	-2.58	-2.88	-3.48
	SBC:	3	*c, SD*		-0.82			
r_{cz}	AIC:	1	*c, SD*	1998M7	-0.62			
	HQ, SBC:	0	*c, SD*		-0.67			
r_h	AIC, HQ:	2	*c, SD*	1995M3	-0.28			
	SBC:	1	*c, SD*		-0.26			
r_p	AIC, HQ:	1	*c, SD*	1998M12	-1.22			
	SBC:	0	*c, SD*		-0.98			
r_r	AIC, HQ:	3	*c, SD*	1997M3	-0.94			
	SBC:	2	*c, SD*		-1.08			
r_{slk}	AIC, HQ:	1	*c, SD*	1998M10	0.33			
	SBC:	1	*c, SD*		-0.54			
Δr_b	AIC, HQ:	4	*c, SD*	1997M2	-6.99			
	SBC:	2	*c, SD*		-12.1			
Δr_{cz}	AIC, HQ, SBC:	0	*c, SD*	1998M1	-11.7			
Δr_h	AIC, HQ:	1	*c, SD*	2003M6	-9.19			
	SBC:	0	*c, SD*		-10.3			
Δr_p	AIC, HQ, SBC:	0	*c, SD*	1998M11	-9.54			
Δr_r	AIC, HQ:	1	*c, SD*	1997M3	-9.14			
	SBC:	0	*c, SD*		-10.6			
Δr_{slk}	AIC, HQ, SBC:	0	*c, SD*	1999M7	-11.5			

Notes: *c, t* and *SD* stand for a constant, a linear trend and seasonal dummies, respectively. AIC=Akaike's Information Criterion; HQ=Hannan-Quinn Criterion; SBC=Schwarz Bayesian Criterion. The unit root tests with one break point and the corresponding critical values (Panel B) are those proposed by Lanne *et al.* (2001, 2002). Computations are performed with JMulTi, Version 4.2.

However, it is well-known that the ADF tests may be distorted in the presence of a shift in the level of the data generation process. Lanne et al. (2001, 2002) propose a unit root test with an unknown break date. The test results (reported in Table 1: Panel B) suggest that all series are I(1). These tests also provide evidence of possible structural breaks in the series. The tests indicate a regime change somewhere in the second half of 1998 for the case of the Czech Republic, Poland and Slovakia; the change is possibly related to the Russian crisis –occurring in August 1998- and the following change of the monetary policies pursued by the three countries. The change in their policies is also related to the change in the monetary policy of the euro area countries and the introduction of the euro in non-physical form in January 1999. The structural breaks identified in the remaining three countries are related to internal policy measures taken by the domestic governments.[5] All in all, the unit root tests provide robust evidence for a unit root in each of the underlying series, so we can maintain that there is

[5] In particular: the break in 1997.3 identified in Bulgaria is related to the 1996-97 economic crisis, which led to a severe depreciation of the lev vis-à-vis the US dollar in March 1997. In the Romanian rate, the 1997 break is related to the stabilisation program, which was launched in January 1997 and included full liberalisation of prices. The break in 1995.3 in Hungary reflects the large devaluation of the fiorint in March 1995.

no evidence for mean reverting behaviour of the six real exchange rates. This is evidence that PPP does not hold between Germany and any of the CEEC6.[6]

3.3 Testing for GPPP using cointegration analysis

The cointegration rank

Based on the results of the unit root tests, we first investigate whether the six real exchange rates cointegrate in a GPPP relationship. We test for cointegration using the Johansen maximum likelihood methodology on Vector Auto-Rregressive (VAR) models (Johansen, 1995). Within this framework, and given that the unit root tests provide some evidence for structural breaks in the series, we also perform the Saikkonen and Lütkepohl (S&L) tests (2000a; 2000b), which test for the cointegration rank allowing for structural shifts in the VAR systems. The analysis is performed for two periods. To this end, we estimate two unrestricted VARs for the vector x_t = (rb, rcz, rh, rp, rr, rslk) using multivariate least squares. The VAR systems are estimated assuming a constant in the deterministic variable set. The number of included lags in the VARs is determined on the basis of the Akaike information criterion and is set equal to two. The diagnostic statistics are satisfactory for both systems.

The cointegration results for the full sample are reported in Table 2, Panel A. The maximum eigenvalue tests developed by Johansen (1995) indicate evidence for one cointegrating vector at the conventional 5% level, but the trace test does not reject the hypothesis of no cointegration.[7] The results from the S&L tests, which are also reported in Table 2: Panel A, provide evidence for r=1. Overall, the results are quite inconclusive.

However, the results for the post–euro period, presented in Table 2, panel B, provide evidence for one cointegrating vector: The real exchange rates are closely integrated and form a GPPP relation during this period. According to the results, the six countries may have been operating as an optimal currency area in the post-euro period.[8] This change in the findings possibly reflects higher trade integration in the post-euro period and the higher level of coordination in the economic and exchange rate policies among the CEEC6, once they decided to join the EU. In fact, the monetary policy institutions, the goals and institutional settings of the central banks of the CEEC6 have converged to some degree in the recent years (for similar arguments, see inter alia Angeloni et al., 2007).

[6] These results are in line with the findings on studies examining the behavior of real exchange rates and the validity of PPP in Central and Eastern European economies for the recent period (see, inter alia, Christev and Norbakhsh, 2000; Dibooglu and Kutan, 2001; Sideris, 2006b, 2008).

[7] Following Juselius (2006), the trace test is more robust than the maximum eigenvalue test.

[8] These findings are in line with those of the relevant literature: Angeloni et al. (2007) report that the real exchange rates of ten NMS –which include the CEEC6- tend to converge in the post-1999 period. Candelon et al. (2007) provide estimates of fundamental-based real exchange rates of eight NMS and indicate that their differences from the observed rates tend to disappear in the period 1999-2003. Horvath (2007) finds out that a group of NMS - including the CEEC6- are well aligned with the euro area for the period 1999-2004.

Table 2

Cointegration analysis

Testing for the cointegration rank						
Johansen tests					S&L tests	
Panel A: Full sample						
Rank	Max eigen.	c.v. (95%)	Trace	c.v. (95%)	LR	c.v. (95%)
0	**41.13***	40.07	94.60	95.75	**93.85***	83.80
1	22.95	33.87	53.46	69.81	56.08	59.95
2	13.68	27.58	30.51	47.85	38.62	40.07
3	10.32	21.13	16.82	29.79	19.66	24.16
4	6.49	14.26	6.50	15.49	9.73	12.26
5	0.02	3.84	0.02	3.84	2.84	4.13
Panel B: 1999.1-2007.12						
Rank	Max eigen.	c.v. (95%)	Trace	c.v. (95%)	LR	c.v. (95%)
0	**40.48***	40.07	**101.88***	95.75	**95.49***	83.80
1	27.02	33.87	61.40	69.81	57.58	59.95
2	17.93	27.58	34.37	47.85	33.64	40.07
3	9.18	21.13	16.43	29.79	20.98	24.16
4	6.86	14.26	7.25	15.49	9.93	12.26
5	0.39	3.84	0.39	3.84	3.13	4.13

Notes: The S&L test stands for the cointegration test developed by Saikkonen and Lütkepohl (2000a,b). S&L tests include a constant and seasonal dummies. The number of included lags in the S&L test is determined on the basis of AIC and is set equal to 2. Computations for the S&L test are performed with JMulTi, Version 4.2. The remaining computations are performed with PcFiml, version 9.0.* denotes rejection of the hypothesis at the 0.05 level

The estimated cointegrating relationships. The long-run coefficients

Table 3 presents the estimated vector describing the GPPP relationship between the six real exchange rates for the period 1999.1-2007.12. The vector is normalized on the Czech koruna/ German mark rate. Actually, any real exchange rate could have been applied to create the normalized equations and the koruna/mark rate is picked randomly. The normalized vector reflects the interrelationship among these real exchange rates. The estimated coefficients can be interpreted as long-run elasticities. In the vector, all coefficients except that of the Polish zloty/ mark rate are significant at the 5% level; the Polish zloty/ mark rate is significant at the 10% level. All but the Bulgarian lev coefficients are lower than unity, implying a small size affect. For example, the estimated coefficients show that a 1% rise (fall) in the zloty/mark real exchange rate will induce a 0.17 % rise (fall) in the koruna/ mark real exchange rate. According to Ender and Hurn (1994), if the real exchange rates are only influenced by real output processes of the various nations, the normalized vector coefficients will be smaller the more similar are a country's aggregate demand parameters.

Table 3

The estimated cointegrating vector

The GPPP relationship: 1999.1-2007.12						
	r_{cz}	r_b	r_h	r_p	r_r	r_{slk}
Coefficients	1	-2,041	-0,272	0,177	-0,294	0,953
t-stats		-8.056	-2,209	1,709	-2,617	5,724

The estimated adjustment coefficients

The Johansen maximum likelihood approach also estimates the adjustment coefficients of each variable in the VARs. The adjustment coefficients indicate the speed at which the variables adjust towards their long-run equilibrium. The speed of adjustment shows how quickly any deviation from GPPP tends to correct itself. According to Johansen (1995), if a certain variable adjustment coefficient is insignificantly different from zero, then the variable is known to be weakly exogenous, as the dynamics of this variable are not influenced by the long-run equilibrium relationship.

Table 4 presents the speed of adjustment coefficients for the estimated cointegrated vector. The largest coefficients are found in the case of real exchange of the Czech koruna and the Romanian leu against the mark. The coefficient 0.185 for the Romanian leu implies that the leu/mark real exchange rate adjusts at the rate of 18,5 percent per month toward the long-run equilibrium. The adjustment coefficients of the Slovakian koruna, the Polish zloty and the Hungarian forint are not found to be significant when tested individually, indicating possibly that these real rates are weakly exogenous, i.e. the equilibrium GPPP relationship does not influence their short-run dynamics. Nevertheless, weak exogeneity of these three real exchange rates may be due to often interventions in the foreign exchange markets of Hungary, Poland and the Slovak Republic, by the monetary authorities who targeted the real exchange rate at a predetermined level.[9] Still, these results should be interpreted as indicative of the dynamics of the system, given that the hypotheses tested do not identify the whole cointegrating space and are not tested jointly.

Table 4

Estimated loading coefficients

	loadings	**t-stats**
Δr_{cz}	-0,168	3,711
Δr_b	0,055	1,402
Δr_h	-0,058	0,985
Δr_p	-0,071	0,905
Δr_r	0,185	2,821
Δr_{slk}	-0,006	0,102

[9] For the effects of interventions on the behaviour of the nominal and real exchange rates of a number of CEEC economies see, inter alia Egert, (2007); Sideris, (2008).

4. Conclusions

The present study analyses the degree of convergence of the CEEC6 economies – namely, Bulgaria, the Czech Republic, Hungary, Poland, Romania and the Slovak Republic- with the eurozone, in an attempt to evaluate their readiness to adopt the euro. The work examines whether these countries form an OCA with the eurozone by using the GPPP theory. It also investigates whether the introduction of the euro and the decision of the six countries to join the eurozone had any impact on fostering their integration with the euro area. We argue that the decision of the CEEC6 to join the monetary union and the policy steps made towards convergence with it, have already promoted their integration. This idea is in line with the hypothesis of the endogeneity of the OCA criteria which supports that countries joining a currency union may satisfy the criteria of an OCA ex post even if they do not ex ante.

In the empirical work, cointegration analysis is employed to test the GPPP hypothesis –whether the real exchange rates converge in the long run- after an initial assessment of the stationarity of each real exchange rate series. The cointegration analysis examines the joint behavior of the rates, during (i) the full period and (ii) the period following the introduction of the euro. The results provide evidence in favor of an OCA with the euro area only for the period after the introduction of the euro. They indicate that the group of the six economies has enjoyed a reduction of their real exchange rate instability in the post-euro period. They also indicate that a significant increase in policy convergence has been achieved. Overall the findings imply that the convergence process with the eurozone has been promoted in recent years probably as a result of the convergence of the economic policies of the CEEC6, the structural changes that took place in the economic systems of the countries, and the significant role of the euro on goods and financial markets of the European economies.

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