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Currency boards in the EU accession process

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Abstract

In 2002, fourteen countries were candidates for accession to the EU. A large number of them were ex-socialist countries. The Treaty on Monetary Union (1992) imposed several criteria as conditions for accession to the Monetary Union, independent from the EU accession. The "Euro accession" essentially required compliance with budget, debt and inflation performances close to that encountered in the Euro zone. On the exchange rate side it imposes a period of nominal fixity just before the accession. The main question we want to address in this article is: have currency boards been an efficient tool to support convergence of inflation performances towards Euro zone performances, in comparison to other exchange rate and monetary strategies? Our assumption is that, because the currency boards create a quasi-monetary union, they are an efficient convergence medium. In order to provide evidence to support our hypotheses, we test a restricted co-integration model aiming at a long-run equalisation between local and German prices. The long-run relation facilitates the evaluation of the inertia of the price differential between candidate countries and Germany. In addition, the short-term dynamics provide some evidence regarding the strength of the convergence toward the specified long-run relation.

JEL Classification: C32-33, E31, E52, F31, P34.

Keywords: Currency boards, transition, EU accession, price convergence, panel unit root tests, Bulgaria, Estonia, Lithuania

Résumé

En 2002, quatorze pays ont été candidats à l'intégration européenne. Une grande partie de ceux-ci sont d'anciennes républiques socialistes. Le traité sur l'union monétaire, plus connu sous le nom de traité de Maastricht (1992), précise les conditions préalables à l'intégration monétaire qui sont à distinguer du processus d'intégration de l'Union Economique. Le processus d'intégration à l'Euro exige essentiellement une convergence des performances en termes de déficit public, de dette et d'inflation des pays candidats vers les performances des pays membres. Du point de vue du taux de change, la phase préalable à l'intégration prévoit la fixation du change nominal. La principale question à laquelle nous désirons répondre dans cet article et de savoir si les caisses d'émission (CBA) ont été un outil efficace pour soutenir la convergence des performances d'inflation vers le standard européen en comparaison avec d'autres stratégies de change. Nous supposons que le régime CBA a été un outil efficace dans la mesure où il créé avec l'Euro une quasi union monétaire. De manière à corroborer notre hypothèse nous testons les régimes de change au travers d'un modèle de convergence fondé sur une relation de co-intégration restreinte. L'équation de long terme nous permet d'évaluer l'intégration des prix locaux avec les prix allemands en longue période. L'estimation de court terme, en revanche, donne une indication sur la force de rappel du différentiel d'inflation vers son équilibre de long terme.

Mots-clés : Caisses d'émission, transition, intégration à l'UME, tests de racine unitaire en panel, Bulgarie, Estonie, Lituanie.

1. Introduction.

At the end of the 1980s, most of the socialist republics started a process of abandoning state-dominated economies and implementing market-oriented economies. Such a process appeared to be quite complex, especially on the monetary side. Indeed, countries had to issue stable currencies, independent of the rouble, without any central banking experience. They had to liberalise prices formerly fixed in a context of rationing and they had to facilitate the development of a sound and market-oriented banking system. A large number of experiments tragically failed. In 2002, more than ten of these countries applied for membership of the European economic and monetary union[1]. A difference exists between the accession to the EU and to accession to the monetary union. For example a country could be member of the Union without belonging to the euro zone as Denmark or United Kingdom. Specific criteria are imposed on the "Euro accession". In this paper, we focus on the price and exchange rate conditions of the Monetary accession. We shall investigate the efficiency of a special monetary regime, the currency boards chosen by three countries out of fourteen, in facilitating the compliance of the candidates with the European standard on prices. Using a panel co-integration model restricted to a long-run convergence, we support the idea that price deviation in currency board candidates is among the lowest levels of inertia in the sample. Moreover, the short-run relation of the model provides us with an evaluation of the speed of convergence towards European prices. We conclude that CBAs curb monetary policy in order to comply with Euro standards.

In the first section, we briefly present some experiences of monetary and exchange rate transitions and we explain how and why the one founded on currency boards may be better than other tools at facilitating monetary convergence with Europe. In the second section, we present some technical aspects of our tests.

2. Strategies of monetary transition. A special case: the currency boards.

2.1. Some problems of monetary transition (de Melo, 1997).

At the beginning of the 1990s, the Soviet centrally-planned economy was in ruins. Most of its members abandoned the Soviet vision of economics and tried to adopt a market-oriented economy. We stress two exiting waves: the first concerns the countries of central Europe which are represented in our sample by Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovenia and Slovakia. The second wave came two years later with the

collapse of the USSR. It is represented in our panel by the three Baltic states: Estonia, Latvia and Lithuania. The second wave almost certainly experienced a more difficult transition for various reasons. In terms of currency, the three Baltic republics had to issue a completely new currency, which is a complex operation. The first years of the transition phase had certain detrimental consequences: most of the economies in transition experienced deep and often long-lasting recessions. On the monetary side, the rouble zone witnessed high inflation due to price liberalisation and money overhang (1991). Indeed, in a centrally-administered economy, prices are administratively fixed: they do not reflect the scarcity of goods and very often result in rationing. Price liberalisation thus leads to a surge in prices maintained arbitrarily low. Money in a centrally-planned system was funded on a mono-bank system, i.e. only one bank existed with specialised branches. This single bank was also the Central Bank, in the image of the *Gosbank* in the USSR. Consequently, all the money issued belonged to central bank liquidity. There was no distinction between central bank issue and commercial bank money since there were no commercial banks or any financial establishments other than the single bank. As money in the socialist view is only a unit of account, the single bank applied a soft budget constraint to state and state-owned enterprises. Credit allocation was not led by the interest rate or by the market, but by the central plan which followed an investment plan in order to meet production targets. In this system, the mono-bank was completely passive. As soon as a state-owned enterprise needed money, the bank would provide it without limits. This system caused a huge increase in the stock of liquidity. The price remained low only because of administrative controls; however, once the controls were removed the overhang caused high inflation. In order to avoid the destabilising effect of inflation of the rouble and to establish a two-tier banking system, with private commercial banks in cooperation with a Central Bank, the central and eastern European countries established independent monetary authorities. This process started around 1989. The scenario was worse in the ex-Soviet republics. Indeed, these countries belonged to a monetary union with Russia. When the rouble zone collapsed in 1991, they suffered payment suspension and central bank default in providing notes and coins. In these republics, where wages were usually paid in such a manner[2], note rationing was not possible and they first had to issue a new currency independent of the rouble.

[1] i.e. for a complete list of the sample countries and country information see Appendix A

[2] Wage payment was the most important cash operation in socialist economies and almost the only cash operation effected by state-owned enterprises. Usually, all the cash of wages was driven towards a savings bank. At the end of the system when the wages started to increase much faster than production, an increasing share of wages was paid into unconvertible savings accounts (deMelo, 1997).

The following table, extracted from Reinhardt and Rogoff (2002), present the historical record of exchange rate strategies used by the UE candidates countries.

Bulgaria	May 2, 1990–December 1993 Freely falling/Freely floating/Dual Market January 1994–January 1, 1997 Freely falling/Managed floating January 1, 1997–January, 1998 Peg to DM/Currency Board/Freely falling January, 1998–January 1, 1999 Currency board/Peg to DM January 1, 1999–December, 2001 Currency board/Peg to Euro	Reference currencies are US Dollar, DM and Euro.
Cyprus	July 9, 1973–March 1992 De facto crawling band around DM Band width is +/- 2%. April 1992–January 1, 1999 De facto peg to DM Officially there is a +/-2.25% band. January 1, 1999–December 2001 De facto peg to Euro In January 2001, it was announced that the band width would be widened to +/-15% to be become effective in August 2001.	Notes: Reference currencies are the US Dollar, the Pound Sterling, DM and the Euro.
Czech Republic	September 1990–February 28, 1996 De facto crawling band around DM Band width is +/-2%. Officially tied to a currency basket and then changed to the ECU. February 28, 1996–May 27, 1997 De facto crawling band around DM Band width is +/5-%. Official pre–announced crawling band around DM. Official band width is +/-7.5%. May 27, 1997–December 2001 Managed floating	Notes: Reference currencies are the US Dollar, the DM and the Euro.
Estonia	January 1991–June 20, 1992 Freely falling/Managed floating. There is no price data before this date. June 20, 1992–December 1994 Peg to DM/Currency board/Freely falling January 1991–January 1, 1999 Peg to DM/Currency board January 1, 1999–December 2001 Peg to Euro/Currency board	Notes: Reference currencies are the US Dollar, the DM and the Euro
Latvia	January, 1991–January 1994 Freely falling/Managed floating . There is no price data before this date. On July 20, 1992 The Lativian Ruble replaced the Russian Ruble. On October 19, 1993 the Latvian lats became sole legal tender. February 1994–August 1994 Peg to SDR/Freely falling September 1994–December 2001 Peg to SDR	Notes: Reference currencies are the SDR and the US Dollar.
Lithuania	January 1991–April 1995 Freely falling/Managed floating On May 1, 1992 the Talonas was introduced as legal tender. May 1995–April 1, 1994 De facto peg to US Dollar April 1, 1994–December 2001 Peg to US Dollar/Currency board	Notes: Reference currency is the US Dollar.
Hungaria	April 1, 1957–July 1, 1992 De Facto crawling band around the DM/Multiple rates Band width is +/- 5%. Officially pegged to a basket of currencies. On December 1, 1991 the basket was changed to comprise the ECU and the US Dollar with equal weights. July 1,1992–May 16, 1994 De Facto crawling band around the DM Band width is +/-5%. On August 2, 1993 the DM replaced the ECU. May 16, 1994 1994–January 1, 1999 De Facto crawling band around the DM Band width is +/-2%. At this time the weight of the DM in the basket was increased to 70%. January 1, 1999–December 2001 Pre–Announced crawling band around the Euro Band width is +/- 2.25%.	Notes: Reference currencies are the DM, the Euro, the Ruble and the US Dollar.
Malta	January 1978–January 1, 1999 Moving band around DM January 1, 1999–December 2001 Moving band around Euro	Notes: reference currencies are the Pound Sterling, US Dollar, DM, and Euro.
Poland	January 1988– March 15, 1989 Freely falling/Freely floating. There are multiple rates. Dollar. There is no parallel market data for this period. March 15, 1989–January 1, 1990 Freely falling/ Freely floating/Dual Market Parallel market is legalized. January 1, 1990–May 17, 1991 Freely falling/Dual Market Official rate is pegged to US Dollar. May 17, 1991–April 1993 Freely falling/Dual Market Official rate is set as a pre announced crawling peg to US Dollar. May 1993–May 16, 1995 Dual Market Official rate is set as a pre announced crawling peg to US May 16, 1995–February, 25, 1998 De facto crawling band around Euro. De facto band width is +/-5%. There is a pre announced crawling band around the DM and US Dollar that is +/- 7%. February 25, 1998–October 29, 1998 De facto crawling band around Euro De facto band width is +/-5%. There is a pre announced crawling band around the DM and US Dollar that is +/- 10%. October 29, 1998–March 24, 1999 De facto crawling band around DM/Euro. De facto band width is +/-5%. There is a pre announced crawling band around the DM and US Dollar that is +/- 12.5%. March 24, 1999–April 12, 2000 De facto crawling band around Euro. De facto band	Notes: Reference currencies are the US Dollar, the DM, and the Euro.

	width is +/-5%. There is a pre announced crawling band around the DM and US Dollar that is+/- 15%. April 12, 2000–December 2001 Managed floating	
Romania	July 1957–January 1990 Dual Market. There are multiple exchange rates—25 rates were applied to exports alone. On July 1, 1983 the number of rates was reduced to two. February 1990–November 11, 1991 Freely falling/Freely floating/Dual. Market CPI data available only from October 1989 November 11, 1991–March 2001 Freely falling/Freely floating. April 2001–December 2001 De facto crawling band Band width is +/-5%.	Notes: Reference currencies are the DM, the Euro, and the US Dollar.
Slovak Republic	February 8, 1993–March 1993 Freely falling. The Slovak Koruna is introduced. April, 1993–July 31,1996 De facto crawling band around DM Band width is +/–2% July 31, 1996–January 1, 1997. De facto band width is +/-2%. Pre announced crawling band is +/-5% wide. The official basket also includes the US Dollar with a lower weight than the DM. January 1, 1997–September 1997. De facto crawling band around the DM De facto band width is +/-2%. Pre announced crawling band is +/-7% wide. September 1997–October 1, 1998 De facto crawling band around DM. De facto band width is +/-5%. Pre announced crawling band is +/-7% wide. October 1, 1998–December 2001 Managed floating 100% of the observations remain within a +/-5% band of the DM/Euro.	Notes: Reference currencies are the DM, the Euro, and the US Dollar.
Slovenia	October 1991–February 1992 Freely falling There is no price data before this date. The Tolar is introduced to replace the Yugoslav Dinar. March 1992–March 1993. Freely falling/De facto crawling band around DM Band width is +/- 2%. April 1993–January 1, 1999. De facto crawling band around DM Band width is +/-2%. October 1996–December 2001. De facto crawling band around Euro Band width is +/- 2%.	Notes: Reference currency is the US Dollar.
Turkey	April 1981–March 22, 1983. Managed floating/Parallel market There are multiple exchange rates. On May 1, 1981. The lira was formally de–linked from the US Dollar. March 22, 1983–April 1984. Managed floating. Since 1984 the parallel market premia has largely remained in single digits. May 1984–January 1998. Freely falling/Managed floating February 1998–January 1, 1999. Crawling band around DM/Freely falling Band width is +/-5%. The crawling band is only detected with the 24–month window. January 1, 1999–January 2001. Crawling band around Euro/Freely falling Band width is +/-5% February–2001October 2001. Freely falling/Freely floating	Notes: Reference currencies are the US Dollar, the DM, and the Euro.

In the great majority of cases, intermediate exchange rate policies based on pre-announced devaluation, crawling bands or significantly managed float have been used. The extreme solutions are scarce. Free float had been used essentially in the case of Romania and Turkey, with some essays to manage the float. Fully fix arrangements are also limited to three countries adopting a CBA, Bulgaria, Estonia, Lithuania and Latvia which follows a strict peg to SDR working as a CBA without the institutional commitment. Why such a diversity? A clear trade-off appears to policy makers, on one hand nominal fixity helps to capture the anchor credibility in order to improve macro-economic stabilisation and, thus, disinflation. However, if governments desire a long lasting fixity they have to commit to convergence between the local prices and the international prices. In case of price deviation, the real appreciation of the currency lowers the country competitiveness that has serious real consequences. Well before the effect of real appreciation, a non credible commitment is subject to temporal inconsistency that provokes speculative attacks. In effect, strategies based

on nominal fixity had often known failures due to real appreciation and/or lack of credibility. In consequences, since 1960 to 1997 the part of pegged nominal exchange rate decrease from 90% of the total exchange rate regimes to 50%, in favor of a surge of free or managed floats (Eichengreen 1999, Reinhart, Rogoff 2002). In that respects the CBAs could improve the efficiency of the nominal fixity by making the fixity viable (see next section). We note that CBAs are not alone in the sub-region to run long lasting nominal fixity, Cyprus, Latvia and Slovenia maintain narrow bands or pegs without formal CBA. In case of a nominal peg strategy, the choice of the anchor is an important question. For example, the Lithuanian *Litas* was linked to the US dollar, on the contrary Estonia linked to the Euro (previously DM) and Latvia linked to the SDR. Recently, in order to support the EU accession, Lithuania changes its anchorage to adopt Euro as reserve currency. On the period, most of the peg, except Lithuania, had been linked to the Euro (DM) directly our through a basket shared between US Dollar and European currencies, mostly DM.

On other hand, policy makers could let the nominal exchange rate be determinated by the market and they achieve macro-economic stabilisation by a conservative monetary policy. Such a strategy do not imply price convergence commitments, because the potential price deviation are compensated immediately by exchange rate variation (PPP). However, the low constraint imposes on monetary policy by the exchange rate regime is an incentive to inflationary policy. Economic policy observers note a “fear of floating” that to say a quite irrational aversion to float in addition of the real costs linked to nominal float. In consequences, a sort of medium choice is often made in mixing nominal fixation and periodic devaluations, as in crawling pegs or by important management of the exchange rate. This policy tries to capture both a part of the stabilisation and credibility effect linked to nominal fixity and to preserve the capacity to compensate prices deviations by exchange rate variations in order to avoid external unbalances.

In the EU accession process we have to distinguish two steps. In addition of human right and political freedom requirements, the accession to the UE supposes to capture the community *acquis* of the union, mainly on commercial and legal side, without any special money or change mention. In a second time, the new members, once they belong to the Union, could ask to use Euro as they legal tender. In that respect, the candidates have to meet some criteria defined in the treaty on European Monetary union (Maastricht, 1992). The article (121) fixes four requirements : price stability, debt suitability, exchange rate stability and interest rate convergence. In this paper, we focus in particular on price and nominal exchange rate stability. On the price side, the agreement asks for a lasting price stability and

explicitly for a inflation convergence as it requires a local inflation not above +1.5% of the European mean inflation the year before the Euro accession. On the nominal exchange rate side, the candidates could "not devaluate of it one initiative" that to say it has to fix its nominal exchange rate for at least two years before accession. In consequences, the exchange rate variations will disappear of the monetary policy tools and the monetary policy will be confronted to realise price convergence toward European prices in order to avoid disastrous real appreciation.

1. CBA in stabilization and convergence process.

We assume that a nominal peg is a more efficient strategy for EMU accession in the sense it meets the criterium of price convergence and come ahead the abandon of the nominal exchange rate alterations. In consequences, the countries using such a strategy are supposed to achieve early their price convergence and to be used to run its macro-economic policy without the nominal exchange rate tool. A pegged exchange rate is not however easy to run, it knows in particular serious drawbacks as the risks of time inconsistency and of real appreciation, as previously quoted. Our second assumption is that CBAs alleviate these difficulties. Indeed, the new CBA was designed to avoid the standard drawbacks of a fixed exchange rate. A new generation of Currency Board Arrangements (CBA), first implemented in Estonia, is now used to support transition. Firstly, the regime institutionally fixes the exchange rate by an institutional act. Secondly, it gives credibility for a large reserve availability by imposing a 100% coverage of the central bank issues. The new design of the regime provides monetary authorities with certain discretionary powers, nonetheless within the limits of the full convertibility commitment and of the banking rule. The regime is thus somewhat more complex than it might appear. The balance sheet of the bank is divided into two departments: the issuing department and the banking department. The first is the standard currency board institution. It simply issues local currency in exchange of foreign currency. The second provides banking services: supervision, requirements and loans. However, the resources of the banking department consist of the excess reserves of the issue department. Indeed, the resources of the banking department are the reserve accumulates above of 100% of the bank issues and the profit on foreign reserves which constitutes the seigneuriage. They are important but clearly limited. In most cases, the CBA was chosen because it surely improves the credibility of the fixed exchange rate. Indeed, the institutional determination of the exchange rate eliminates the time inconstancy of the fixed exchange rate regime. The local

agents could clearly anticipate the exchange rate evolution because of the institutional commitment of the monetary authorities.

In addition, the currency boards backing rule limits the base money counterpart to currency reserve. A hard budget constraint is thus imposed on both the public and private sector. In effect, the government and state-owned enterprises are forbidden to ask for central bank loans. In the same way the commercial banks cannot ask for a loan of last resort from the Central Bank. This aspect is quite important in a context of transition. Monetary transition consists, to a large extent, in hardening the budget constraint of the economy. In the case of Bulgaria and, to a lesser extent in the case of Lithuania, the monetary authorities have failed to tighten the budget constraint in particular for the public banking and enterprise sector. This default carries on from the former system. As the inter-bank market was non-existent and the Central Bank did not impose a hard budget constraint on the banking sector, the central bank acted more as *a lender of first resort* (Benlemann, M., Hristov, K., Nenovsky, N., 2002) alleviating all the banks' liquidity needs, than as a lender of last resort, alleviating only systemic money market liquidity shortages. In Estonia, the early currency board system permitted an efficient tightening of the monetary constraint (Knöbl, A., Sutt A., Zavoico, B., 2002). On the fiscal side, neither the local commercial bank nor the local savings market was able to provide enough resources for financing budget deficits[3]. In the absence of monetary budget financing, the government committed to budget equilibrium. In effect, the budget deficit has always been low and compensated for in the medium-term by surplus. Consequently public debt, starting from 0% of the GDP in 1991, rose to only 5% ten years later. In comparison, public debt in Lithuania, which chose a CBA later than Estonia, reached 16%. This low level of indebtedness illustrates the achievement of a tight budget constraint on the Estonian public sector and government.

The transition countries were closed to international markets and less developed than most of the European Union partners. The price of a large number of goods was thus significantly lower than in developed Western European countries. The opening process will tend to make the price level of this country converge toward the price level of European countries, at least for tradable goods. In addition, with growth and economic development, the price of non-tradable goods will also tend to rise, an evolution described by Balassa and

[3] The underdevelopment of local debt markets largely deters, in the first years of transition, external indebtedness except by public loans from international institutions. In other cases, such as Argentina, the CBA facilitates external borrowing and thus a growing indebtedness.

Samuelson[4]. In the absence of nominal exchange rate variations (devaluation) the convergence may provoke real exchange rate appreciation. In the same way, if the external demand for currency on the exchange market is high, the monetary authorities could not, under a CBA, let the exchange rate appreciate[5] in order to avoid a boost of inflation due to the crowding effect of the capital flows. In a CBA, however, as in a monetary union, monetary conditions are driven by external balance. Indeed, a real appreciation could have two kinds of effect. First, it may reduce the price competitiveness of tradable goods and lower the profitability of foreign investment in the export sector, or non-tradable goods could grow more quickly. Second, the price of non-tradable goods could increase more than the price of tradable goods, pegged to the international market price. The profitability of non-tradable activities thus becomes greater than that of tradable activities, consequently resources are evinced from tradable industries which lose productivity and, thus, competitiveness. The main effect, finally, is for external accounts to deteriorate. In a CBA, the deterioration of external accounts immediately provokes a monetary contraction. The effect of the monetary tightening will bring the price down to a bearable level in relation to the anchor country. The regime therefore disposes of an automatic mechanism for monetary adjustment of the external balance, which makes price and interest rates converge toward the anchor performance. Often, some specific features permit a CBA to deviate slightly from the anchor. For example, in Estonia, the hard budget constraint on the public sector has resulted in the rapid growth of productivity which compensates for local inflation, higher than that witnessed in Germany, without loss of competitiveness.

In 2001, fourteen countries were candidates for European Union membership. Forward to the UE accession the European Commission fixed certain conditions for entering to the monetary union, especially in terms of inflation, interest rate, debt and nominal exchange rate fixation. These conditions were essentially aimed at making the candidates converge towards European performances. We argue that the CBA supports monetary accession in the sense that it provides a quasi-monetary union with the Euro. In effect, the wide opening in commercial and financial terms, assures the country adopting a CBA a rapid convergence of

[4] In short, the BS effect supposes that during the development process, tradable goods will naturally experience higher productivity growth than the non-tradable goods sector. The wages in the tradable sector should thus increase in correspondence with the productivity growth. The factor mobility is assumed to be large enough to transmit the wage increase to non-tradable sector wages and consequently to non-tradable goods prices. The process induces a real exchange rate appreciation.

[5] in the case of Estonia, only devaluation is forbidden. The *Eesti Pank* is, however, allowed to reassess the Kroon.

tradable goods prices and interest rates towards those of the Euro zone, led by arbitrage on international markets. This quick adjustment, even if resulting in some short-lived inflation boosts, avoids perpetuating monetary instability and chronic inflation. After that, the monetary mechanism acts as a convergence force which prevents the monetary performances of the country from deviating from those of the anchor in the long run. In addition, the CBA supposes a strong fiscal commitment to equilibrium. Deficits are low, and compensated for in the medium-term by surplus. Consequently, the local deficits should respect the European budgetary rules. In the case of Estonia and Lithuania, which started with a 0% GDP debt, the total debt is still very low today.

In the next section, we try to give some empirical evidence regarding these assumptions in order to answer the question: is a currency board an efficient tool to facilitate accession to monetary union?

2. Price convergence for Euro candidates : are currency boards better?

We have chosen to investigate only the question of price convergence. Other monetary indicators could have been studied, such as the interest rate. However, consumer prices seem to be more relevant to capture the extent of the monetary integration between the Euro zone and its candidates. Indeed, the local consumer prices will depend on trade and finance liberalisation, but also on the monetary policy and its credibility, though that the interest rate might be influenced more by short-term arbitrage on the capital international market.

Unit root test for price convergence between Germany and candidates.

Recently, convergence literature has been enriched by tests based on a panel unit root test. The idea is simple: the authors look for unit roots in the difference of a relevant aggregate between two places. If the difference demonstrates a unit root, this means that the difference between the two places experiences considerable inertia, i.e. the two places do not converge. These techniques are frequently used to estimate convergence and divergence from purchasing power parity, a question rather similar to ours. For example, authors (Kocenda and Papell, 1997, Nenna, M., 2001) test the stationarity of the differences in inflation between different parts of Europe; if the panel exhibits a unit root, this means that the difference between local price growth is permanent, thus the regions do not converge toward the same rate of inflation. They choose coherent regional sub-division in order to reflect a special kind of monetary or exchange regime and they test if the countries following such a type of

monetary policy converge or diverge from the remainder of the sample. Here, we only want to apply the same procedure to a consumer price level indicator between candidate economies and a Euro zone anchor. The most relevant Euro zone anchors seems to be the German price level in that Germany remains the most important economy of Europe and because for more than ten years it has been the monetary policy reference for the Euro zone. We thus use the difference between candidate price levels on a monthly basis from 1990 to 2001 with the German price level on the same basis and for the same period[6]. Using the German price level guarantees a completely independent reference variable, which alleviates further statistical difficulties such as panel endogeneity. We can surely rely on the weak exogeneity of the variable. Our assumption rests on the fact that Germany is a major country compared to the candidates. The interest of the price level is to obtain the accumulated inflation performances since the beginning of the transition until the eve of accession. The variable of interest for each candidate, each period could thus be written:

$$Y_{i,t} = I_{i,t} - I_{g,t} \quad (1)$$

$I_{i,t}$ is the price level in the candidate country (i) in the period (t) and $I_{g,t}$ is the price level in Germany at time (t).

By construction, the variable $Y_{i,t}$ assumes a co-integration or long-run relation between local and German prices with a special restriction on the coefficient of the explanatory variable to one. With such a restriction, the model rests on the assumption that, in the long run, local prices should be equal to German prices at a means reverting or stationary deviation. We can also write the long-run relation of the model as :

$$I_{i,t} = I_{g,t} + e_{i,t} \quad (2)$$

$I_{i,t}$ and $I_{i,G}$ are two completely different variables. Previously, we check the order of integration of each country's price level with de-trended Phillips Perron following an ERS[7] process. For each test, we implement a more complete specification with trends, intercepts and lags determined following the Schwartz criterion. Table A2, in the appendix, reports the results of these tests. Almost all countries, except the strange case of Slovenia, could be assumed to be stochastically non-stationary with a first order integration. We notice that the residual of the

[6] the indicator takes the value 100 in 1995.
[7] Elliot, Rothenberg and Stock (1996)

long-run relation $e_{i,t}$ is equivalent to the price level differential $Y_{i,t}$ .Our variable is observed, thus is a price level difference, and is not estimated as the residual of a regression. If the convergence hypothesis holds, the restricted model (2) should be a good co-integration specification. Consequently, the deviation from equation (2), that is to say $Y_{i,t}$ equivalent to $e_{i,t}$, should be stationary in order to obtain the mean reversion feature.

Our purpose is not to check some relative PPP, in that case we have to add exchange rate in the relation (2). A PPP estimation diverges from the prices convergence approach in the sense that exchange rate variations are used in order to compensate price divergences. In consequences the PPP could hold without price convergence by compensating price divergence with exchange rate variations. In order to clearly mark the difference, we add a PPP specification of the following form.

$$I_{i,t} = I_{g,t} + NER_g + e_{i,t} \quad (3)$$

This specification rests on the assumption that the German price is the international price for the countries of our panel, in consequences the exchange rate with the euro (DM) is relevant to compensate price deviations. This specification is thus non adapted for a country as Lithuania which had been linked until 2000 to US dollar. Each variables are log variables, by the way if the exchange rate is fixed with the Euro (DM) the logarithm of NER_g takes the value 0, the relation (3) becomes thus equivalent to the relation (2). In term of stationnarity, a fixed nominal exchange rate is obviously a stationary variable that could not make the price differential non stationary. On the contrary a non fix rate that compensates inflation differential is supposed to be non stationary.

For testing the price differential co-integration, we implement unit root tests based on Phillips Perron ERS method with the largest time series available for each countries since 1980. As we use monthly data, we apply a systematic de-seasonalisation for price data. By screening the individual statistics, we could class the candidates according to the significance of their unit root. We could, thus, determine the group where the inflation differentials between candidates and Germany exhibit a clear inertia and the group where the same differential is stationary. Consequently, we could assess the group of countries for which the long-run equation as specified in (2) provides a good co-integration relation and the group where local and anchor prices are not co-integrated. The test carefully controls for the deterministic component. We assume that the deterministic component rests on a Balassa-Samuelson effect which should be quite important in the context of transitional countries. Our

specification controls for individual specific intercepts and trend. We assume that the stochastic component rests on monetary activism and external punctual shocks which provoke an erratic evolution of local prices. On the contrary, the deterministic component is more relative to structural developments that appear unavoidable. The stochastic component, assuming that the external shocks are, to a large extent, common to the all countries in the sub-region, reveals whether or not the local monetary policy converges towards German monetary policy.

Table 1.

Inflation differential inertia for candidates compared to Germany for the period 1990-2001.

Phillips Perron ERS stat.	Obs..	Prices convergence(1)	PPP (2)	Regimes
Bulgaria 1991:03 2002:01	131	-1.52 (0.82)	-5.5 (0)	Free float to fully fix Currency : Dollar to Euro
Bulgaria 1998:01 2002:01	48	-8.1 (0)	..	Fully fix (CBA) Currency : Euro
Cyprus	263	-3.3 (0.05)	-4.31 (0)	Crawling bands to Peg Currency: DM to Euro
Czech	96	-0.55 (0.97)	-2.85 (0.18)	Crawling peg to managed float Currency DM to Euro
Estonia	107	-7.5 (0.0)	-4.45 (0.0)	Fully fix (CBA) Currency: DM to Euro
Hungary	249	-2.75 (0.25)	-3.66 (0.0)	Crawling bands Currency: DM to Euro
Latvia	107	-6.6 (0.0)	-0.89 (0.95)	Peg to SDR Currency: SDR & Dollar
Lithuania	100	-13 (0.0)	-3 (0.13))	managed float to fully fix (CBA) Currency: Dollar to Euro
Malta	259	-1.22 (0.9)	-4.1 (0.0)	Peg to moving bands Currency : DM to Euro
Poland	163	-2.59 (0.28)	-3.48 (0.0)	Crawling bands to managed float Currency : dollar to DM-Euro
Romania	120	-1.9 (0.5)	-6.7 (0.0)	Free float to crawling bands: Currency : dollar to DM-Euro
Slovakia	96	-3.6 (0.0)	-2.5 (0.31)	Crawling bands to managed float Currency : dollar to DM-
Slovenia	108	-6.7 (0.0)	-2.8 (0.18)	Euro -Crawling bands Currency : dollar to DM
Turkey	263	-1.8 (0.68)	-4.6 (0.0)	Managed float to free float Currency : dollar and DM-Euro

For Bulgaria which lastingly implemented strategies different from that of a CBA, we distinguish the total period, 1991:03 – 2002:01, and the period under CBA, 1998:01 – 2002:01**.** The distinction is relevant only for Bulgaria which exhibits a reduction in the inflation inertia following the adoption of the currency board. Regrettably, the CBA of

Bulgaria lasting since just 4 years, the period is not large enough to keep the country in our panel as a CBA representative.

The hypothesis of unit root in the inflation differential could not be rejected in the case of a group including Romania, Turkey, the Czech Republic, Poland, Malta, Bulgaria (1991-1998) and Hungary. In these cases the co-integration, assumed in (2), does not hold. The three CBAs belong to the stationary group which also includes Latvia, Cyprus, the Slovak republic and Slovenia. Among convergent countries three use a fixed exchange rate regime based on a CBA. Of the three convergent CBAs, two initially implemented a money target and nominal float finally abandoned for a CBA, i.e. a fixed exchange rate. Latvia and Cyprus maintain a strict peg for a long period, Slovenia and Slovakia maintain them narrow bands with Euro (previously Dutch Mark), +/-2% for Slovenia, +/-5 for Slovakia. On the period the non-CBA convergent countries make their peg tighter to the anchor. Of the non-convergence cases, countries soften they exchange rate commitment as the Czech republic or Poland. They seem to use significantly their ability to change the nominal exchange rate in order to compensate price deviation. Indeed, controlling for the exchange rate level vanish price deviation for Malta, the Czech republic, Hungary, Poland, Romania and Turkey.

In conclusion, it appears that significant price deviation between candidate prices and German prices has been recorded since the transition. Moreover, this price deviation seems to be lasting. The more efficient strategies are based on a nominal anchor strict enough, as the three CBAs. In the other cases, the ability to compensate price divergence is greatly used and seems to dissuade efficient convergence policies. The unit root test focuses essentially on the stochastic tendency of the variable, i.e. on the political, and not the structural, side of the price evolution. In this way, we find that the CBA belongs to a monetary regime which efficiently curbs local monetary policy towards the anchor's monetary policy.

Monetary convergence : the dynamic relation.

In the following section, we provide an estimation of the dynamic relation linking the price level variation, i.e. inflation, between candidates and Germany. Indeed, the dynamic relation is defined as the Engle Granger second step, or the short-term relation corresponding to the long-term relation defined in (2). Consequently, we could specify our model as :

$$\Delta I_{i,t} = \alpha_i + \beta_i t + d_{is} + \delta_1 \Delta I_{i,t-1} + \delta_2 \Delta I_{i,t-2} + \delta_2 \Delta I_{i,t-3} + \varphi_1 \Delta I_{g,t-1} + \varphi_2 \Delta I_{g,t-2} + \varphi_2 \Delta I_{g,t-3} + \sigma e_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$\Delta I_{i,t}$ and $\Delta I_{i,g}$ are the local and German price variations respectively. We tested earlier the order of integration of the price level $I_{i,t}$ and $I_{i,g}$ and assume that each one is integrated of order one, thus that their first difference is stationary. Consequently, the variables $\Delta I_{i,t}$ and $\Delta I_{i,g}$ are stationary or integrated of order 0 and we could thus use the traditional inference methods. Despite the assumed stationarity, we pay attention to the determinist component of the endogenous variable, local inflation, by adding to the specification an intercept, a specific fixed effect and individual time trends that are represented in equation (2) by α, α_i and $\beta_i t$. These variables should capture the inevitable modification in price evolution that rests on structural developments. As the price data are monthly, we add to the specification (3) seasonal dummy variables, d_{is} ,for quarter, half year and year, in order to control for possible seasonal price variations.

How should the short-term relation results be analysed? We know that a strongly significant, negative coefficient, inferior to minus one, in front of the error-correction term signifies a good and reliable co-integration relation. If we refer to our assumptions about the long-term relation, good co-integration assumes long run equalisation between German and local prices, i.e. a one-to-one relation plus a stationary error term as defined in equation (2). In addition, the short term dynamic gives us the speed of the convergence. Indeed, the error-correction term indicates the strength of the convergence force which curbs the short-term deviation back to the long-run relation. The following tables give the estimation of the short-term dynamic for the two sub-samples, convergent (co-integrated) and non-convergent (non co-integrated).

Table 2. Panel short-term relation between local inflation and German inflation.

		Non-convergent sample (1306 obs.)	Convergent sample (836)
$\Delta I_{i,t-1}$		0.21 (0.0)	0.069 (0.0)
$\Delta I_{i,t-2}$		0.06 (0.0)	0.042 (0.17)
$\Delta I_{i,t-3}$		-0.36 (0.0)	-0.41 (0.0)
$\Delta I_{g,t-1}$		1.5 (0.0)	1.4 (0.0)
$\Delta I_{g,t-2}$		-0.3 (0.5)	-0.19 (0.66)
$\Delta I_{g,t-3}$		-0.74 (0.1)	0.11 (0.78)
$e_{i,t-1}$		0.0022 (0.818)	-0.10 (0)

Table 3.

Individual feature of the group estimation

		Fixed effect	Error correction term allowed to vary across countries
convergent	Cyprus	-0.12 (0)	-0.16 (0.0)
	Estonia	-0.12 (0.0)	-0.088 (0.0)
	Latvia	-0.13 (0.0)	-0.098 (0.0)
	Lithuania	-0.10 (0.0)	-0.2 (0.0)
	Slovakia	-0.12 (0.0)	-0.11 (0.0)
	Slovenia	-0.12 (0.0)	-0.11 (0.0)
Non convergent	Bulgaria	0.049 (0.0)	-0.0045 (0.7)
	Czech	-0.011 (0.6)	-0.018 (0.83)
	Hungaria	-0.0044 (0.83)	-0.0045 (0.0)
	Malta	-0.01 (0.5)	-0.047 (0.85)
	Poland	0.0034 (0.87)	-0.025 (0.0)
	Romania	0.041 (0.0)	-0.016 (0.0)
	Turkey	0.028 (0.16)	-0.0002 (0.95)

As expected, the convergence coefficient in front of $e_{i,t-1}$ is non-significant for the sample that diverges from the long-run convergence relation defined in (1). On the contrary, the sample consistent with the relation (1) exhibits a strongly significant convergence coefficient, relevant to the good fit of the co-integration specification. The size of the coefficient is (-0.10) on a monthly basis, which represents a relatively strong convergence. The lagged inflation has a more important impact on the non convergent sample than on the convergent one, revealing the stronger inertia of inflation in the first group. On the contrary, external inflation, that to say German inflation, leads in a larger extend the local inflation in the convergent sample revealing this time a grater price integration of the second group.

Between nominal peg, no specific exchange rate strategies seems to significantly accelerate or refrain convergence speed. Indeed, we note that Estonia and Latvia which implement respectively a currency board and a peg, have the most significant error correction term but inferior to the panel mean. On the contrary, Lithuania and Cyprus, which implement

also respectively CBA and pegs are above the panel mean. Furthermore, we could simply conclude that the CBAs are at least as efficient as other strategies that permit convergence with German prices. The four other convergent countries of the sub-sample, Cyprus, Latvia, Slovakia and Slovenia, implement also a *de-facto*, if not *de-jure*, lasting peg and success to make it credible without specific institutional commitment. In some cases, as Cyprus or Slovenia, they could be help by specific features that induce a natural integration with the Euro zone. Nonetheless, the convergent countries, essentially those which use a currency board as a monetary and exchange rate strategy, have a greater opportunity to equalise local prices quickly with German prices than those which chose others strategies, whatever their specific conditions.

3. **Conclusion**

Monetary transition was founded on different strategies: some based on nominal exchange rate anchorage, others on more active exchange rate manipulations. This investigation does not aim to evaluate the success or failure of each one. We simply focus on the inflation differential with Germany from the perspective of accession to the Euro Union. In this context, nominal fixity seems to have a clear advantage in order to convergence toward the Euro monetary standard in comparison to more flexible exchange rate regime. In that respect the crawling or managed floats that aim to mix the advantages of both strategies seem to systematically fail to induce price convergences. The persistence of the ability to change the nominal exchange rate looks, thus, deterrent of prices convergence.

One of the most important handicaps for each strategy is the difficult trade-off between monetary stabilisation and competitiveness. In particular, it was believed that monetary stabilisation could be achieved only at the price of a real appreciation, and therefore a loss of competitiveness. In this context, the CBA thus demonstrates certain specific advantages. First, it provides credibility to lastingly fix the nominal exchange rate. Second, it builds a quasi-monetary union. Indeed, it rests on an automatic monetary adjustment of external accounts that influences the price evolution following the variation of external competitiveness. Furthermore, it breaks the stabilisation-competitiveness dilemma and guarantees price convergence with the monetary anchor.

Our tests reveal that the CBAs belong to the best experiments in order to alleviate the inflation differential inertia with the Euro zone. In addition, we can argue that the CBAs essentially curb the monetary policy toward a low inflation bias, despite the perpetuation of

some structural price trends different from those witnessed in Germany, which can be explained by differences in the level of development and productivity growth.

Appendix A1.

The associated countries and the European Union (extract from Europa)

Country	Association Agreement signed on	Accession application submitted on	Association Agreement OJ reference
Bulgaria	1-3-1993	14-12-1995	OJ L 358, 31.12.94
Cyprus	19-12-1972	3-07-1990	OJ L 133, 21.05.77
Czech Republic	6-10-1993	17-1-1996	OJ L 360, 31.12.94
Estonia	12-6-1995	24-11-1995	OJ L 68, 9.3.98
Hungary	16-12-1991	31-3-1994	OJ L 347, 31.12.93
Latvia	12-6-1995	13-10-1995	OJ L 26, 2.2.98
Lithuania	12-6-1995	8-12-1995	OJ L 51, 20.2.98
Malta	5-12-1970	3-7-1990	OJ L 61, 14.3.71
Poland	16-12-1991	5-4-1994	OJ L 348, 31.12.93
Romania	8-2-1993	22-6-1995	OJ L 357, 31.12.94
Slovakia	6-10-1993	27-6-1995	OJ L 359, 31.12.94
Slovenia	10-6-1996	10-6-1996	OJ L 51, 26.2.99
Turkey	12-9-1963	14-4-1987	OJ 217, 29.12.64

Appendix A2.

Price level unit root test.

ERS de-trended	Lag (Schwartz criterion)		Trend p-value		Phillips Perron P-value		Integration order
					Level	First difference	
	level	First difference	level	First difference			
BULGARIA (130 obs.)	1	0	0.05	0.44	0.62	0.0	I(1)
CYPRUS (143 obs.)	1	3	0.0	0.14	0.1562	0.0001	I(1)
CZECH (128 obs.)	2	1	0.06	0.01	0.28	0.0	I(1)
ESTONIA (119 obs.)	3	2	0.89	0.0	0.5255	0.0	I(1)
GERMANY (143 obs.)	1	0	0.53	0.1	0.91	0.0	I(1)
HUNGARY (155 obs.)	3	2	0.0	0.0	0.27	0.0	I(1)
LATVIA (119 obs.)	1	0	0.97	0.0	0.397	0.0	I(1)
LITHUANIA (115 obs.)	2	1	0.0	0.0	0.81	0.0	I(1)
MALTA (143 obs.)	0	0	0.0	0.047	0.28	0.0	I(1)
POLAND (155 obs.)	1	3	0.67	0.56	0.91	0.0	I(1)
ROMANIA (133 obs.)	1	0	0.0	0.0	1	0.0	I(1)
SLOVAKIA (128 obs.)	0	1	0.02	0.32	0.2786	0.0	I(1)
SLOVENIA (120 obs.)							
TURKEY (143 obs.)	13	13	0.21	0.0	1	0.107	I(1)

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