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"Monetary Convergence of the EU Candidates to the Euro: A Theoretical Framework and Policy Implications"

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Abstract: A flexible approach to direct inflation targeting is a viable monetary policy choice for transition economies that is believed to facilitate both the economic transition and the monetary convergence to the euro. Following this assumption, an analytical model investigating the link between the inflation process and monetary variables in transition economies is advanced in this study. The empirical testing is conducted for Poland, the Czech Republic and Hungary. The analysis recommends that the monetary convergence begins with inflation targeting and concludes with a full-fledged euroization. It further advocates the application of flexible benchmarks of monetary convergence that would accommodate various non-monetary factors affecting inflation in transition economies.

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I. Introduction

During the first decade of economic transition, monetary policies in Central European countries relied on fixed exchange rates for building monetary stability and credibility. Commitment to stable exchange rates, along with prudent fiscal policies, helped these countries lower inflation to single digit levels. But in order to bring it down further to the levels comparable with those in the European Union, monetary authorities in these countries face a challenge of designing appropriate policy strategies and tactics. Fixed exchange rates were intrinsically built into the program of comprehensive economic reform and were the only feasible option at the beginning of transition. They served as a crucial policy anchor for launching the process of disinflation. As the transition has advanced, the transition countries have abandoned currency pegs. Their exit strategies have been made possible by the ongoing institutional development of financial markets and banking systems that enabled the application of indirect instruments of monetary policy. Consequently, central banks in transition economies of Central Europe have begun searching for appropriate autonomous monetary policies that could underpin their commitment to pursuing price stability.

The underlying assumption of my analysis is that the Central European transition countries who are now the candidates for the EU accession will be well advised to strengthen the monetary policy framework of direct inflation targeting (DIT) at their present stage of transition. A flexible approach to DIT will likely facilitate a successful monetary convergence to the EU of the candidate countries. I refrain from engaging in the ongoing discussion on the viability and feasibility of a 'leap to euroization' (in the sense of an early unilateral adoption of the euro as a legal tender). The debate on this subject has been extensive and inspiring (Begg, et.al, 2001; Bratkowski and Rostowski, 2001). In my opinion, euroization is an ultimate and beneficial policy option for these countries. However, before its possible adoption, the EU candidates need to establish 'foundational credibility' through autonomous monetary policy resulting in a sustained period of price stability (Orlowski, 2000 and 2001).

While advocating an autonomous monetary policy based on DIT, I propose an analytical model examining the link between the inflation process in transition economies and a set of monetary variables. The model is empirically tested for Poland, the Czech Republic and Hungary - all of them have officially enacted various forms of DIT. The empirical analysis provides useful information about the monetary policy transmission channels. It is aimed at identifying effective tools of disinflation in these economies. The empirical findings provide guidance for improving the existing inflation targeting systems. The focal point of my investigation is the assessment of whether monetary policies in these countries are backward or forward-looking, and the evaluation of the exchange rate, the aggregate demand and the rational expectations channels of monetary policy transmission. The analysis centers further on feasibility of a flexible, rather than a strict approach to inflation targeting. Flexible inflation targeting not only preserves commitment to disinflation, but also allows for controlling other policy objectives, such as income growth or exchange rate stability. The latter is particularly important for achieving a successful monetary convergence to the euro.

The study begins from an overview of the current monetary policy regimes in Poland, the Czech Republic and Hungary, by presenting the foundations of their present DIT in Section II. The institutional framework of these policies is useful for designing the model reflecting the link between inflation and monetary policy variables in transition economies, which is presented in Section III. The empirical tests of the model are analyzed in Section IV, and the concluding Section V summarizes key findings and presents several recommendations for advancing autonomous monetary policies in these relatively advanced transition economies.

II. Inflation Targeting Regimes of the Czech Republic, Poland and Hungary

Stabilization programs in Central European transition economies that were initiated in the early 1990s played a pivotal role in bringing inflation down to single digit levels over the course of several years. This was accomplished by a set of measures including currency pegs, followed later by implicit target zones for exchange rates. Such policies served as nominal anchors for macroeconomic discipline. Other policy measures that assisted the process of disinflation included privatization and de-monopolization of state companies, trade liberalization, deregulation of financial systems and tight fiscal policies. As the transition advanced, Central European countries have decided to depart from exchange rate targeting and seek alternative measures that would provide sufficient policy discipline allowing further reduction in inflation to more sustainable levels. Currency pegs brought about problems of real appreciation of domestic currencies and the subsequent troubles with current account deficits and capital inflows that precipitated inflation. In response, governments of Central European countries have decided to depart from exchange rate targeting and to look for a more credible nominal anchor for monetary policy. They did so at different times and with dissimilar determination.

Poland abandoned a rigid peg of the zloty (PLN) to the dollar already in May 1991, although it maintained implicit target zones for the exchange rate accompanied by crawling devaluation until April 2000. During the period 1996-1998, the National Bank of Poland (NBP) experimented with targeting interest rate (1996), monetary base (1997) and M2 money growth (1998). None of these alternative regimes were suitable for a country in transition that experienced deep structural changes, strong relative price adjustments and a fast growing monetization (as reflected by the growth of M2-to-GDP ratio from 15 percent in 1991 to 45 percent in 2000). Under such circumstances, the actual money growth exceeded significantly any reasonable targets that were set at levels comparable to those in Western economies. Interest rate targeting has proven to be erroneous as well, because Poland and other small open transition economies are subject to sizeable changes in capital inflows that induce large, temporary shocks to interest rates. This vulnerability to external capital shocks was particularly evident at the time of the Asian financial crisis of 1997-1998 that brought about strong contagion effects to their financial markets (Linne, 1999; Gelos and Sahay, 2000). In search for an explicit nominal anchor for monetary policy, the NBP decided to adopt a system of DIT as of January 1999.

The Czech National Bank (CNB) introduced a similar policy framework a year earlier. It did so in response to a struggle with the rigid currency peg that was maintained

until 1997, and that brought about significant real appreciation of the Czech Koruna (CKR) and a deep current account deficit (Brada and Kutan, 1999). These macroeconomic imbalances, along with the institutional deficiencies in the financial sector precipitated a deep crisis of the Czech financial system in the summer of 1997 (Linne, 1999). A monetary policy framework of DIT was a viable and prudent response to the vacuum in the policy discipline created by abandoning the currency peg.

Pursuing a distinctly different approach to monetary policy, the National Bank of Hungary (NBH) maintained a crawling peg system of the Hungarian Forint (HUF) to the Euro (EUR) accompanied by a narrow tolerance band of 2.25 percent on either side of the parity until May 2001. In spite of the prolonged currency peg, Hungary was able to mitigate real appreciation of the HUF, thus to alleviate large balance of payments disequilibria thanks to maintaining wage discipline, productivity gains and large inflows of foreign direct investments. Recently however, the NBH faced increasing problems with manageability of large short-term capital inflows and with inflation levels stubbornly exceeding those of Poland and the Czech Republic. Needless to say, crawling devaluation has exacerbated inflationary pressures on the Hungarian economy. Responding to these mounting problems, the NBH has decided to launch a DIT system as of June 2001.

As of mid-2001, monetary authorities of all three countries officially follow policies of DIT. In my opinion, these policies are particularly useful and viable at the present stage of economic transition and also at the time of a global economic slowdown coupled with increasing political and financial risk. In the presence of slower economic growth, fiscal discipline is seriously jeopardized by lower than expected budget revenues and by political reluctance to cut government expenditures. This aggravates the risk of a lax fiscal discipline as the growing budget deficits are already projected to exceed 5 percent of GDP in all three countries in 2000 and 2001 fiscal years. Consequently, monetary policy will have to assume a stronger responsibility for pursuing disinflation, thereby also for facilitating monetary convergence to the euro. Policies based on a currency peg would require a high degree of fiscal tightness since they would eradicate monetary autonomy, which is simply not feasible at the present time. For this reason, a premature return to a euro-peg would indubitably fail to facilitate reaching the goals of monetary convergence to the EU/EMU. Without doubt, autonomous monetary policies based on DIT seem to provide a sufficient framework for achieving ambitious goals of disinflation.

Thus the countries in transition will be well advised to resist recent calls for income targeting monetary policies that are becoming popular in the United States, Japan, or even in the European Union. Income targeting is consistent with monetary easing that is unsuitable for countries that are struggling with fiscal discipline. Similar strategies applied by the economies in transition could hinder monetary discipline, reinvent the spiral of nominal indexation, and jeopardize disinflation. Income targeting might be viable for averting recession in highly developed industrial countries, but it would be too costly for transition countries and, in principle, for other emerging market economies.

The approaches to inflation targeting and the degree of its advancement are not uniform among the three examined countries. Specific features of these policies are presented in Table 1.

Table 1: Inflation Targeting Regimes: the Czech Republic, Poland and Hungary

	Czech Republic	**Poland**	**Hungary**
Type of DIT regime	Headline CPI inflation targeting (with net inflation as a supporting target); relatively strict net inflation targeting prior to 2001	CPI inflation targeting, strict	CPI and core inflation targeting, flexible (implicit) with some attention to exchange rate stability
Corresponding exchange rate regime	Managed float	Float	Implicit target zone of +/- 15% against EUR, 0.2% monthly rate of crawling devaluation
Policy inception date	January 1998	January 1999	June 2001 (announced June 12, 2001)
Long-term inflation target	2.0 % net inflation with a +/- 1% tolerance band for the end of 2005, prior to EMU accession in Jan. 2006	CPI inflation of 4.0% for the end of 2003	CPI inflation of 2.0% reached by March 2004, prior to the targeted EMU accession in Jan.2006
Recent operating targets: *a. December 2001* *b. December 2002*	a. 2.0-4.0% net and 4.3-5.8% CPI inflation b. dynamic range descending evenly from 3.0-5.0% CPI and 2.0-4.0% net inflation in Jan.2001 to the long-term target	a. 6.0-8.0 % CPI inflation b. 4.0-6.0% CPI inflation	a. 6.0-8.0 % CPI inflation b. 3.5-5.5% CPI inflation
Recent CPI y-o-y inflation (August 2001)	5.5%	5.1%	8.7%
*Inflation Risk Premium** *a. Jan. 1998-Dec. 1999* *b. Jan. 2000-June 2001*	a. 4.73% b. 1.18%	a. 8.48% b. 8.60%	a. 4.10% b. 0.92%
Forward-looking mechanism	Inflation forecasts, monthly revised, incorporate a survey of inflation expectations of ten banks	Inflation forecasts, unspecified time, active use of policy bias for two quarters ahead	Rolling inflation forecasts for 6 quarters ahead, revised monthly
Inflation reports	Quarterly, annual	Quarterly, annual	Quarterly (as of Aug. 2001), annual
Target announcements	CNB Board in consultations with MF	NBP Monetary Policy Council	NBH Council, transparent methodology

*Notes: * Inflation Risk Premium is computed as a difference between average monthly interest rates on three-months Treasury bills and the average CPI year-on-year inflation rates.*

Source: The author's own compilation, based on CNB, NBP, and NBH data and reports.

A pioneer among inflation targeting banks in Central Europe, the CNB introduced net inflation targeting in January 1998, as a follow up to abandoning the fixed exchange rate in May 1997. During the period 1998-2000, CNB targeted net inflation that was based on changes in the index of retail prices but excluded administratively regulated prices and fees. The CNB intention was to distance itself from shocks in CPI inflation induced by sharp increases in governmentally regulated prices and fees that were

routinely conducted at the beginning of each year until January 1998. Specifically, the annual increases in administrative prices reached 22.7 percent in 1997, 20.4 percent in 1998 and only 4.2 percent in 1999. The recent smaller increases in regulated prices certainly have helped shift the CNB policy focus from net inflation to CPI-based inflation targeting. The operating targets for December 2001 and December 2002 are based on CPI rather than net inflation levels, as shown in Table 1.

The long-term inflation target has been set by the CNB at 2.0 percent net inflation with the tolerance band of one percent on either side of the midpoint level for the end of 2005. Adherence to the long-term target and the dynamic trajectory of disinflation that is fully consistent with this target is a dominant measure of efficiency of the Czech DIT system. The achievement of interim targets is monitored on a monthly basis in terms of deviations of actual inflation from the target trend. This is a prudent approach that increases transparency and discloses a long reaching path of operating targets. It also underpins the CNB commitment to reaching the predetermined inflation targets. Because of its higher transparency and predictability, the dynamic trajectory approach is superior to the end-of-year specification of operating targets that does not convey adequate information about long-term inflation forecasts. It is because possible revisions of year-end targets downplay the importance of the long-term goal and question feasibility of pursuing the trajectory leading to this goal. Such revisions might also cast doubt on commitment of central banks to reach the long-term goal. Therefore, recent decisions of the CNB to emphasize the long-term goal and the dynamic inflation trajectory make the Czech DIT system highly transparent and purposeful. Furthermore, the dynamic approach alleviates unnecessary and unproductive struggle with fiscal authorities about operating inflation targets. In a common policy practice, governments willing to run larger budget deficits often exert pressures on central banks to raise short-term inflation goals. Such pressures become irrelevant if a central bank's policy is bound by adherence to the dynamic trajectory of disinflation.[1] Undoubtedly, the dynamic trajectory approach enacted by the CNB gives it more leverage in the disputes about the necessity to maintain monetary policy discipline. For this reason, the Czech DIT system is clearly superior to the Polish regime, which emphasizes adherence to year-end targets that in turn instigates routine criticism of the central bank for its excessively restrictive policy and overly ambitious inflation targets.

The CNB has developed a fairly advanced system of inflation forecasting in spite of a number of technical deficiencies that are prevalent at the present stage of economic transition. These obstacles include high instability of monetary variables in the small, open economies that are susceptible to contagion effects of external financial crises. They also include short time series of data, the time consistency of which is further distorted by frequent systemic changes in monetary regimes. The CNB has been able to alleviate these deficiencies at least partially by conducting surveys of inflation forecasts of ten leading institutions in the Czech financial system. By doing so, it is able to detect inflation expectations of the financial sector and relate them to the official inflation forecast in order to devise appropriate policy responses.

The Czech DIT regime began from a relatively strict version of inflation targeting. The tolerance band during the first two years was set at 0.5 percent around the

[1] The advantages of targeting a trend-consistent inflation trajectory over the emphasis on year-end operating targets are convincingly explained by King (1996).

midpoint targets (the year-end net inflation targets were 5.5-6.5 percent in 1998, and 4.0-5.0 percent in 1999). As the system evolved and inflation become considerably lower, the bands of operating targets were increased to one percent in 2000 and 2001. Consistently, the year-end target setting was replaced by a dynamic inflation trajectory. These modifications certainly improved transparency of the DIT regime and made monetary policy more predictable for financial institutions. The ongoing development of the Czech DIT system has enabled the CNB to relax restrictiveness of monetary policy and improve credibility, as implied by declining inflation risk premiums in Table 1.

A similar advancement of the DIT system is not apparent in Poland. The NBP launched inflation targeting in January 1999. Initially, it applied a strict version of CPI-based targeting with a narrow tolerance band of 6.6-7.8 percent for the end of 1999, and 5.4-6.8 percent for the end of 2000. The target band has been eventually increased and broadened to 6.0-8.0 percent for 2001, since the target was missed during the first two years of the new policy regime. Consistently, Poland's financial authorities applied a floating exchange rate system as of April 2000, replacing the previous broad target zone of exchange rate of plus-minus 15 percent. In spite of its failure to reach the 1999 and 2000 operating targets, the NBP has demonstrated a strong determination to pursue the long-term CPI inflation goal that has been set at 4.0 percent for the end of 2003. It has done so by maintaining interest rates at very high levels, as reflected by high inflation risk premiums shown in Table 1. Such a restrictive monetary policy has resulted in the lowest level of actual inflation among the three examined countries (Table1). The CPI inflation is likely to fall well below the operating target set for December 2001.

The Polish DIT system has yet to prove visible gains in monetary credibility. The decreasing trend of CPI inflation has been accomplished by very restrictive monetary policy, as proven by high inflation risk premiums reported in Table 1. A slow progress of the Polish DIT system may be at least partially attributed to the vagueness of the official pronouncement of its strategies, objectives and guiding rules. While the Polish system overemphasizes the importance of accomplishing year-end operating target, its determination is not fully supported by the disclosure of official inflation forecasts. Although the NBP Monetary Policy Council frequently refers to the future 'policy bias' in its official announcements and reports, the actual policy changes seem to rely heavily on backward-looking, rather than forward-looking expectations (Orlowski, 2001).

Hungary is the newest member of the 'inflation targeting club' in Central Europe. The NBH has officially begun pursuing DIT in June 2001, after realizing that the previous strict exchange rate targeting system did not help accomplish goals of price stability. At the time of the new policy announcement in May 2001, Hungary's CPI annualized inflation was running at 10.8 percent, well above the levels in the Czech Republic and in Poland. The NBH has set a long-term target at 2.0 percent to be reached by March 2004, or two years prior to the anticipated entry to the eurozone in 2006. Consistently, the operating target has been set for the next two years at the levels reported in Table 1. Accomplishing these targets will be a challenge; it will require a better coordination of fiscal and monetary policies than the one prevailing in Hungary for the past several years. The previous monetary system was based on the HUF peg to the euro with a narrow band of 2.25 percent on either side of parity and accompanied by crawling devaluation (recently at 0.2 percent monthly rate). The currency peg was not very successful in lowering inflation to sustained single digit levels, because it failed to

provide sufficient policy discipline that would facilitate a successful monetary convergence to the euro. Monetary policy in Hungary will have to be more restrictive than that implied by low inflation risk premiums shown in Table 1. However, the degree of restrictiveness can be relaxed if the government is able to demonstrate stronger commitment to fiscal discipline.

Although it is too early to detect any meaningful results of the new policy, the Hungarian DIT system seems to be well drafted and exhaustively explained. Its rules are transparent, reinforced by a comprehensive articulation of the forward-looking mechanism that relies on monthly revised rolling inflation forecasts for six quarters ahead.

In sum, it is not a coincidence that the monetary authorities in the three advanced Central European transition countries have chosen to apply DIT regimes at the present stage of transition and monetary convergence to the euro. They need to demonstrate clear commitment to disinflation, particularly at the present time of high fiscal policy uncertainty. They need to prove ability to reach price stability by applying modern, forward-looking monetary regimes. Similar complex policies could not had been enacted in these countries at earlier stages of economic transition in the absence of the necessary institutional framework (developed financial markets) and analytical tools (methods of inflation forecasting) to support such policies. Nevertheless, the technical advancement of these countries' DIT regimes is far from being perfect. There is a room for improving techniques of forecasting inflation and modeling monetary policies. Following this belief, I attempt to design an analytical model prescribing the inflation process in the economies in transition. Its empirical tests might be useful for designing appropriate venues of monetary convergence to the euro.

III. A Dynamic Inflation Process in Transition Economies

Recognizing the experience of Central European monetary authorities with gradual departure from fixed exchange rate regimes, I advocate the relevance of DIT at the present stage of transition. This type of monetary policy allows focusing on disinflation as a primary goal of monetary policy, which makes it a viable starting point of monetary convergence to the euro. The policy long-term target, which is consistent with a predetermined trajectory of disinflation, will help facilitate transition to a stable currency regime. Therefore, I propose a dynamic policy sequence that begins with a strict form of DIT, followed by a more flexible approach that is based on combination of well-specified inflation targets and supporting targets for the (floating) exchange rate. At its final stage, the monetary convergence will conclude with a full-fledged euroization, not necessarily preceded by a peg to the euro. The convergence process may take several years and one may argue that the proposed sequence entails too many and too costly changes in monetary regimes. However, I believe that the process is based essentially on two regimes: inflation targeting, and full euroization. The latter may be accomplished through a one-time, radical change, or a 'leap to the eurosystem', when the candidate

countries reach a satisfactory level of price stability comparable with that in the eurozone[2].

In search for optimal policy for the transition economies that are targeting inflation, I make several assumptions that are derived from the prominent analysts of DIT regimes, particularly Svensson (1999, 2000 and 2001), Eichengreen (2001) and, specifically for transition countries, Siklos and Abel (2001). These assumptions are essential for designing an analytical model that represents the inflation process in transition economies.

1. I advocate a forward-looking character of DIT regimes in transition economies. Accordingly, central banks will be well advised to adjust policy instruments in response to changes in inflation forecasts. A forward-looking approach provides a comfort of keeping interest rates at considerably lower levels than those prevailing under backward-looking policies. While responding to inflation forecasts, central banks may use a future policy (tightening) bias that will help them refrain from applying exorbitantly high interest rates.
2. DIT systems ought to be transparent. Policy goals, strategies and tactics need to be thoroughly explained to the public at large and, in some instances, fully consulted with qualified institutions and specialists. Full communication of policy rules and actions, particularly in the environment of transition economies, becomes indispensable for breaking a cycle of inflation inertia that stems from nominal, backward-looking indexation of wages and prices.
3. Central banks need to have good knowledge about the prevailing channels of monetary policy transmission. There is a common belief that the exchange rate channel is predominant in transition economies, particularly in Hungary (Golinelli and Rovelli, 2001), although in Orlowski (1999) I suggest to downplay its dominance in the cases of Poland and the Czech Republic. However, in order to further disinflation, central banks may want to find methods leading to a more active role of the rational expectations channel. This can be accomplished through more transparent and forward-looking policy rules and actions.
4. Perhaps most importantly, central banks must be free of government dominance and of constraints imposed on them by lax fiscal policies. DIT is successfully implemented when fiscal discipline is maintained and when the entire government shares responsibility for pursuing goals of price stability.

Taking these assumptions into consideration, I devise a model aimed at explaining the inflation process applicable to specific conditions of countries in transition. It begins from a simple, open economy Phillips curve in the form proposed by Svensson (2000):

$$\pi_t = \alpha_\pi \pi_{t-1} + \alpha_y y_t - \alpha_e (e_t - e_{t-1}) + \xi_t \qquad (1)$$

where

[2] There is an exhaustive literature supporting the bi-polar view of exchange rate regimes and proving that interim solutions, such as implicit target zones for exchange rate, are too costly (see for instance, Masson, 1999; Fischer, 2001; Eichengreen, 2001)

$$y_t \equiv y_t^d - y_t^n \tag{2}$$

with y_t^d being a log of aggregate demand and y_t^n the natural level of output that is assumed to be exogenous.

The log of real exchange rate e_t is the sum of the log of nominal rate s_t and the inflation differential of the log of domestic price p_t^d and the foreign price level p_t^f:

$$e_t \equiv s_t + p_t^d - p_t^f \tag{3}$$

In this form, the nominal exchange rate s_t is expressed as a foreign currency value of a unit of domestic currency, thus an increase in s_t means nominal appreciation and an increase in e_t real appreciation of domestic currency.

The open economy inflation process can be extended by the introduction of forward-looking expectations:

$$\pi_t = \alpha_\pi \pi_{t-1} + (1-\alpha_\pi)\pi_{t+\tau/t} + \alpha_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] - \alpha_{e1}(e_t - e_{t-1}) + \alpha_{e2}(e_{t+\tau/t} - e_t) + \xi_{1t} \tag{4}$$

This is an open-economy Phillips curve with forward-looking expectations. The function reacts to the lagged effect of real exchange rate movement $(e_t - e_{t-1})$, as well as to the direction of the real exchange rate forecast for τ -periods ahead, formulated at time t, which is $(e_{t+\tau/t} - e_t)$. The inflation response to the real exchange rate forecast is assumed to be strongly affected by interest rate differentials and by shocks to capital inflows. The role of the exchange rate channel of monetary policy transmission is reflected by α_{e1} and it is more pronounced if the coefficient has a higher absolute value. The shift parameter α_π varies between 0 and 1 and it reflects the relative importance of backward (when it is close to 1) or forward (close to 0) looking expectations. The forward expectations are geared to the inflation forecast $\pi_{t+\tau/t}$ for τ -periods ahead, formulated at the present time t. The shift parameter α_π is assumed to be diminishing as the policy becomes more credible and, at the same time, more responsive to forward-looking expectations.

The expected variation in the real exchange rate $(e_{t+\tau/t} - e_t)$ is assumed to be dependent on the international Fischer effect:

$$e_{t+\tau/t} - e_t = r_t^d - r_t^f + r_t^M + \upsilon_t \tag{5}$$

where r_t^d is the domestic and r_t^f is the corresponding foreign short-term interest rate. The interest rate differential is augmented with r_t^M, which is the interest rate risk reflecting the credibility gap between domestic and foreign monetary systems, and with υ_t, which represents the asset price shock (the Calvo-type shock, as prescribed by Eichengreen, 2001).

By assumption, the interest rate risk premium fully corresponds to the currency risk premium θ_t in these small open economies whose monetary policies closely follow those of their larger foreign partners. Thereby,

$$r_t^M = -\theta_t \tag{6}$$

The currency risk premium can be introduced in (5) and the augmented international Fischer effect will assume:

$$\lambda(r_t^d - r_t^f) - \theta_t + \upsilon_t = (1-\lambda)(e_{t+\tau/t} - e_t) \tag{7}$$

In this relationship, λ is introduced as the policy bias parameter. High λ implies reliance on interest rate adjustments in response to changes in foreign rates, as a key tool of policy operations. Adversely, a low value of λ suggests active management of expected real exchange rates, as a predominant policy devise. Moreover, high λ is consistent with a floating exchange rate system within which the nominal exchange rate closely follows inflation differentials thus causing a steady expected path of real exchange rate. Under such circumstances, changes in the domestic interest rate r_t^d relative to foreign rate r_t^f directly respond to changes in θ_t and under more discretionary policy also to υ_t. If λ is close to zero, monetary policy strongly relies on the exchange rate channel of the policy transmission. Then, a central bank responds to the observed changes in θ_t with currency devaluation or revaluation. A medium level λ indicates application of implicit target zones for the exchange rate.

The currency risk premium θ_t is exogenous. It depends on long-term gains in macroeconomic stability of the country relative to its foreign partners. External shocks are also exogenous, although they have normally a short-term impact on the economy and do not require corrective adjustments in interest rates.

It can be further noted that $\lambda = 1 - \alpha_{e2} = \alpha_r$ within the framework of (4). Thereby, the augmented international effect prescribed by (7) inserted into the inflationary process (4) results in:

$$\pi_t = \alpha_\pi \pi_{t-1} + (1-\alpha_\pi)\pi_{t+\tau/t} + \alpha_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] - \alpha_{e1}(e_t - e_{t-1}) + \alpha_r(r_t^d - r_t^f + \gamma\upsilon_t) + \alpha_\phi\phi_t + \xi_t \tag{8}$$

The actual experience of the economic transition calls for an assumption that the parameter α_ϕ is slowly diminishing as the currency risk premium improves. However, it remains to be nearly constant in the short-run. In addition, γ_t is believed to be rather negligible. Possible shocks to γ_t can be either permanent or transitory. If they are permanent and large, it may be plausible for a central bank to target monetary conditions index (MCI), thus to respond to currency depreciation by raising interest rates (Hunt, 1999). If they are transitory, these shocks do not require active policy responses. It can be noted that pass-through effects of currency depreciation are shown in (8) separately,

following their treatment in the model advanced by Ball (1999). In principle, pass-through effects have a transitory nature since rising import prices normally affect inflation only temporary and active policy responses to them with higher interest rates would only amplify the volatility of output and inflation (Eichengreen, 2001). In his seminal study, Ball (1999) suggests that the MCI ought to be adjusted not only to movements in the CPI-based inflation, but also to fluctuations in inflation that are adjusted for the real exchange rate movement. Then, a central bank will target not only CPI inflation alone, but also the overall domestic inflation that takes into consideration exchange rate and/or income variables[3]. Consequently, the system will follow a flexible inflation-targeting framework, such as the one suggested by (8). Among other considerations, a central bank that applies a flexible inflation target needs to monitor the values of α parameters. They ought to have a finite sum in order to avoid large destabilizing effects of monetary policy on income or on exchange rates.

It can be further assumed that interest rate differentials in a small open economy with liberalized capital account are likely to react to shocks to capital inflows, thus γ_t may have a non-zero value.

The inflationary process (8) can rearranged to display the instrument rule:

$$\alpha_r(r_t^d - r_t^f + \gamma\upsilon_t) = \pi_t - \alpha_\pi\pi_{t-1} - (1-\alpha_\pi)\pi_{t+\tau/t} - \alpha_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] + \alpha_{e1}(e_t - e_{t-1}) - \alpha_\theta\theta_t - \xi_{2t} \tag{9}$$

It can be further rearranged into a feedback rule for monetary policy that incorporates backward and forward-looking variables and open economy parameters:

$$r_t^d = 1/\alpha_r\{\pi_t - \alpha_\pi\pi_{t-1} - (1-\alpha_\pi)\pi_{t+\tau/t} - \alpha_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] + \alpha_{e1}(e_t - e_{t-1}) - \alpha_\phi\phi_t\} + r_t^f - \gamma\upsilon_t + \xi_{3t} \tag{10}$$

In order to make the general process (10) more applicable to monetary regimes that are based on inflation targeting, it is necessary to formulate an appropriate feedback (or reaction) function of a central bank. The Reserve Bank of New Zealand, which has pioneered DIT, has developed a reaction function that offers useful guidance for inflation targeting in small, open economies (Nadal de Simone, 1998):

$$s_t - s_{t-1} = \bar{\pi}_{t+\tau/t} - (\pi^f_{t+\tau/t} - \pi^f_t) - \delta[(\pi^d_{t+\tau/t} - \pi^d_t) - \bar{\pi}_{t+\tau/t}] \tag{11}$$

where $\bar{\pi}_{t+\tau/t}$ is the domestic inflation target, or more specifically, the trajectory-consistent level of inflation set for τ-periods ahead, s_t is the nominal exchange rate, and $\pi_{t+\tau/t}$ denotes forecasts of foreign (f) and domestic (d) inflation for τ-periods ahead. The function can be reset for domestic inflation:

$$\pi_t^d = \pi^d_{t+\tau/t} - (1-\alpha_s)\bar{\pi}_{t+\tau/t} + \alpha_s(\pi^f_{t+\tau/t} - \pi^f_t + s_t - s_{t-1}) \tag{12}$$

[3] A useful analysis of the role of exchange rate stability in the inflation-targeting framework is presented by Haldane (1997).

This model seems to be suitable for transition economies that are becoming increasingly dependent on foreign monetary conditions since it emphasizes the impact of external shocks to the exchange rate on domestic inflation, as reflected by a stronger role of α_s. Under perfectly flexible exchange rates, rising foreign inflation leads to appreciation of domestic currency, thereby it has no effect on domestic inflation.

Inserting (12) into (8) allows for modification of the domestic inflation process that becomes:

$$\pi^d_{t+\tau/t} - (1-\alpha_s)\overline{\pi}_{t+\tau/t} + \alpha_s(\pi^f_{t+\tau/t} - \pi^f_t + s_t - s_{t-1}) =$$
$$= \alpha_\pi \pi^d_{t-1} + (1-\alpha_\pi)\pi^d_{t+\tau/t} + \alpha_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] - \alpha_{e1}(e_t - e_{t-1}) + \alpha(r^d_t - r^f_t + \gamma\upsilon_t) + \alpha_\phi\phi_t + \xi_{4t} \tag{13}$$

Based on (13), the domestic inflation forecast for τ -periods ahead can be stated as:

$$\pi^d_{t+\tau/t} = \pi_{t-1} + (1-\beta_s)\overline{\pi}_{t+\tau/t} - \beta_s(\pi^f_{t+\tau/t} - \pi^f_t + s_t - s_{t-1}) + \beta_y[y_t - \eta(y_{t-1} - y_{t+\tau/t})] -$$
$$- \beta_e(e_t - e_{t-1}) - \beta_r(r^d_t - r^f_t + \gamma\upsilon_t) + \beta_\theta\theta_t + \xi_{5t} \tag{14}$$

where $\beta_y = \alpha_y/\alpha_\pi$; $\beta_e = \alpha_e/\alpha_\pi$; $\beta_r = \alpha_r/\alpha_\pi$; and $\beta_\theta = \alpha_\theta/\alpha_\pi$.

In the dynamic inflation forecast function, the values of β coefficients provide monetary authorities with information about the nature of the inflation process and policy transmission channels. This knowledge is essential for determining appropriate policy feedback rules. Specifically, a low value of β_s suggests pursuing an independent forward-looking inflation targeting, and its value being close to unity implies a non-autonomous policy that strongly depends on the external inflationary environment. If the remaining β coefficients are zero, the process follows strict inflation targeting, while their non-zero values, particularly these of β_y and β_e, imply a flexible approach to inflation targeting.

Dynamic changes in β coefficients can be applied to the environment of transition economies. Specifically, monetary policies in these economies might have started from relatively high values of β_s and β_e upon inception of pegged exchange rates. With the advancement of economic transition, these two coefficients might have played a diminishing role and the projected inflation might have been increasingly sensitive to the remaining β coefficients. However, these general statements may not always reflect the experiences of individual countries, because systemic foundations of their monetary policies have changed at different directions, timing and pace.

IV. Empirical Evidence

A straightforward application of (14) aimed at assessing monetary policy conditions in Poland, Hungary and the Czech Republic is not plausible for several technical reasons that can be summarized as follows:

1. These countries have not pursued full-fledged forward-looking monetary policies yet. Thus the empirical testing of the future expected inflation $\pi_{t+\tau/t}$ based on the recent available data could not be conclusive. Therefore, I have chosen the current inflation level π_t as a dependent variable in the tested model.
2. Policy makers in these countries have not officially conducted estimations of the output gap and the GDP data are certainly reported on the quarterly basis. For these reasons, I have chosen the index of industrial production as a proxy for each country's output and the data have been seasonally adjusted in order to eliminate large, transitory shocks.
3. The connection between interest rates and inflation has been refocused onto the impact of short-term interest rate differentials (three months Treasury bills) as well as bank lending rates differentials between individual transition countries and Germany. The differences in bank lending rates are believed to have impact on inflation through international flows of bank credit. If domestic lending rates are too high relative to foreign rates, businesses and individuals may borrow large amounts of credit from abroad thus accelerating capital inflows. Moreover, the underdeveloped bond markets and the lack of adequate data on long-term Treasury bond rates have hindered a proper assessment of risk premiums, which are incorporated in domestic nominal interest rates and not extracted separately.
4. The empirical analysis is based on monthly data series in the period January 1995–June 2001. Although earlier data are available for these countries, their inclusion would distort the empirical findings due to serious systemic inconsistencies. Earlier monetary policies were based on currency pegs and were implemented with less complex, direct instruments. Prices were less flexible - they were subject to vast administrative interference, financial markets were less developed and capital flows were constrained. Thereby conclusions based on the past foundations are likely to be invalid for explaining the current environment of monetary policies.
5. Inflation targets have been specified only very recently, upon the adoption of DIT systems and the dynamic target trajectories have not been officially designed (with the exception of the Czech Republic). Therefore, I have estimated smoothed series of inflation trajectories with Hodrick-Prescott filters.

Taking these obstacles into consideration, the empirically tested model has been designed as:

$$\pi_t^d = \beta_0 + \beta_1\pi_{t-1}^d + \beta_2\pi_{t+\tau/t}^d + \beta_3(\pi_{t+\tau/t}^G - \pi_t^G + s_t - s_{t-1}) + \beta_4 IP_t^{sa} + \beta_5(e_t - e_{t-1}) + \\ + \beta_6(r_t^{sd} - r_t^{sG}) + \beta_7(r_{t-1}^{ld} - r_{t-1}^{lG}) + \xi_{6t} \qquad (15)$$

where nominal exchange rates s_t reflect domestic currency values of the euro (based on DEM/1.95583 before 1999), IP_t^{sa} is a seasonally adjusted (with Census X11 additive) index of industrial production, superscripts *G* denote German variables, r_t^s are three months Treasury bill rates, and r_t^l are prevailing bank lending rates.

The empirical assessment of β sensitivity coefficients provides useful information about the monetary determinants of inflation and about the features of the existing monetary system. The systemic characteristics can be summarized as follows:

1. If the estimated value of β_1 is high and the values of β_2, β_3, β_4 and β_5 are low, the monetary system follows a strict, backward-looking DIT policy.
2. High estimated values of β_2 and low β_1, β_3, β_4 and β_5 imply a strict, forward-looking DIT.
3. Low β_1, β_2 and β_4, combined with high β_3 and β_5 suggest a successful policy of strict exchange rate targeting.
4. Medium levels of β_1 and β_2 accompanied by higher absolute values of β_3, β_4 and β_5 indicate flexible inflation targeting (certainly, if these levels are consistent with deliberately set targets). A stronger influence of β_3 and β_5 relative to β_4 suggests a dominant role of exchange rate stability rather than income growth within a wider band of tolerance around the inflation target. In addition, the advantage of β_2 over β_1 implies a stronger role of forward-looking expectations.
5. A high value of β_5 indicates effective functioning of the exchange rate channel of monetary policy transmission, while high β_2 means reliance on the rational expectations channel. By contrast, high value of β_7 means a stronger role of the credit channel. Simultaneously, a higher value of β_6 means effective influence of short-term interest rate differentials, thus a strong impact of speculative capital inflows on inflation.

In the above form (15), the model emphasizes the monetary and income variables that can be influenced by monetary authorities, at least to some degree. In other words, it incorporates variables that might be considered in the determination of monetary policy goals and appropriate instruments. There are, however, important determinants of inflation that play a crucial role in transition economies, which are not included in the model. Among them are administrative price adjustments, taxes and wage indexation. Because of their exogenous relation to monetary policy, or the inability of central banks to influence them, these variables have not been included in the tested model. Consequently, the deterministic value of the model is lower because of this exclusion. Nevertheless, the model is specifically designed to provide guidance for determining monetary policy goals, tactics and instruments based on the variables that are more directly related to it.

Direct estimation of (15) is limited by non-stationarity of almost all variables included in the model for all four countries (Poland, the Czech Republic, Hungary, and

Germany). This problem is reflected by the results of the Augmented Dickey Fuller (ADF) stationarity test shown in Table 2.

Table 2: ADF Unit Root Test for Stationarity

	τ	τ'
Poland:		
CPI inflation (year-on-year)	-3.3212	-4.3796
PLN value of EUR	-1.4962	-6.4004
Real Effective Exchange Rate	-3.8139	-6.1710
3-Months T-bill Rate	-2.1475	-5.3124
Bank Lending Interest Rate	-2.0012	-9.0308
Industrial Production (s.a.)	-2.9208	-10.7855
CPI Inflation Trend (HP Filter)	-14.0890	-6.6438
Czech Republic:		
CPI inflation (year-on-year)	-1.7435	-4.3005
Net Inflation (year-on-year)	-1.3547	-3.2033
CKR value of EUR	-2.6602	-5.4235
Real Effective Exchange Rate	-3.1242	-5.9715
3-Months T-bill Rate	-1.4417	-5.2822
Bank Lending Interest Rate	-1.7408	-6.2429
Industrial Production (s.a.)	-2.5330	-11.1618
CPI Inflation Trend (HP Filter)	-14.7370	-12.6049
Net Inflation Trend (HP Filter)	-8.0890	-10.3223
Hungary:		
CPI inflation (year-on-year)	-2.2860	-6.0356
HUF value of EUR	-2.2026	-7.3226
Real Effective Exchange Rate	-3.3117	-7.4129
3-Months T-bill Rate	-2.7323	-6.3964
Bank Lending Interest Rate	-0.9714	-4.0292
Industrial Production (s.a.)	-2.0466	-11.8208
CPI Inflation Trend (HP Filter)	-22.7070	-15.1321
Germany:		
CPI inflation (year-on-year)	-1.0786	-7.7034
3-Months T-bill Rate	-2.7494	-5.7991
Bank Lending Interest Rate	-0.7249	-5.7819
CPI Inflation Trend (HP Filter)	-10.3429	-11.1949

Notes: τ is based on the ADF test for unit root in the level of the variable, including trend and intercept, with one lagged difference and τ' is for the first difference of the variable, including trend and intercept, with one lagged difference. These τ indicators are certainly different from the τ time horizon operators in the model used for forecast variables. McKinnon critical τ-values are: –4.0803 at one percent, -3.4681 at five percent, and –3.1606 at ten percent probability. The τ-value of the Czech net inflation in the second difference of the variable is –7.4156. Trend inflation variables are based on Hodrick Prescott filter estimation. They are reported only for the purpose of completing

the list of all variables included in estimation of (15). Industrial production indexes are seasonally adjusted with Census X11 Additive.

Source: Own calculations based on data from the International Monetary Fund, the Czech National Bank, the Czech Statistical Office, the National Bank of Poland, the National Bank of Hungary, and PlanEcon (real effective exchange rates).

As evidenced in Table 2, all examined variables (with the exception of the Polish real exchange rate) are non-stationary at their levels. All of them become stationary in the series representing their first differences. Therefore, the empirical estimation of (15) is based on the function representing first differences of all dependent and independent variables. The results of these regressions are shown in Table 3.

Table 3: Estimation Representations of (15)

	Poland's CPI Inflation	**Czech CPI Inflation**	**Czech Net Inflation**	**Hungary's CPI Inflation**
$\hat{\beta}_0$	**0.098**	**0.070**	**0.056**	**0.151**
	(0.127)	(0.139)	(0.070)	(0.167)
	(0.775)	(0.507)	(0.799)	(0.900)
$\hat{\beta}_1$	**0.462**	**0.246**	**0.467**	**0.439**
	(0.107)	(0.119)	(0.093)	(0.097)
	(4.298)	(2.076)	(5.034)	(4.522)
$\hat{\beta}_2$	**1.063**	**1.347**	**1.156**	**0.534**
	(0.411)	(1.332)	(0.584)	(0.550)
	(2.580)	(1.011)	(1.978)	(0.971)
$\hat{\beta}_3$	**-0.013**	**-0.155**	**-0.210**	**0.050**
	(0.241)	(0.128)	(0.063)	(0.022)
	(-0.052)	(-1.205)	(-3.312)	(2.237)
$\hat{\beta}_4$	**0.033**	**0.021**	**0.028**	**0.025**
	(0.013)	(0.015)	(0.008)	(0.013)
	(2.578)	(1.404)	(3.368)	(1.931)
$\hat{\beta}_5$	**0.007**	**0.013**	**-0.002**	**-0.003**
	(0.009)	(0.020)	(0.010)	(0.022)
	(0.035)	(0.668)	(-0.209)	(-0.146)
$\hat{\beta}_6$	**0.003**	**0.305**	**0.022**	**0.148**
	(0.090)	(0.119)	(0.065)	(0.109)
	(0.035)	(2.561)	(0.346)	(1.358)
$\hat{\beta}_7$	**0.077**	**0.086**	**0.165**	**0.424**
	(0.035)	(0.163)	(0.086)	(0.158)
	(2.203)	(0.528)	(1.929)	(2.689)
R^2	0.44	0.26	0.51	0.47
adjusted R^2	0.38	0.18	0.45	0.41
Durbin Watson	1.80	2.24	2.39	2.19
Akaike info.	1.86	2.33	1.00	2.05

Notes: $\hat{\beta}$ are estimated values of the corresponding β coefficients in (15). Standard errors are reported in upper and t-statistics in lower parentheses. The time horizon τ is two quarters (six months) ahead, thus $\pi_{t+\tau/t}$ is regressed as a 6 months ahead forecast of inflation, based on the trend estimated with the Hodrick Prescott filter.

Source: Own calculations based on data as in Table 2.

The empirical testing of (15) shows that the factors that determine the inflation process vary quite significantly for all three economies. The examined series do not suffer from mean reversion (or 'random walk') since the estimated values of β_0 are all close to zero and the Durbin Watson statistics are within the tolerance range (around 2). The absence of mean reversion means that the last realization of the change in π is a good forecast for its next realization.

The model is fairly explanatory in the cases of the Czech net inflation and Hungarian and Polish CPI inflation, but less for the Czech CPI inflation. These findings support the statement that the Czech CPI inflation was strongly influenced in the investigated period of time by the factors unrelated to monetary policy, such as adjustments in administrative prices, VAT rates and import duties (Brada and Kutan, 1999). Within this context, the recent switch by the CNB into CPI inflation targeting may be correct as long as the Czech Government will refrain from large increases in regulated prices that were last conducted in 1998. Moreover, the investigated function does not take into consideration significant changes in relative prices induced by Balassa-Samuelson effects (BSE). The BSE phenomenon is based on the notion that a faster productivity growth in the traded goods sector tends to drive up wages in all sectors, thus relative prices of non-traded goods to those of the traded goods will rise. BSE is pronounced in catching-up economies, since their productivity growth is normally faster than that in industrial countries. These effects are quite strong in the candidate countries for the EU accession and they contribute to the persistence of inflation (Szapáry, 2000). Consequently, they tend to disconnect a link between the inflation process and changes in monetary variables.

As shown in Table 3, both backward and forward looking expectations do affect current inflation rates, however, at various degrees. While in Hungary backward-looking expectations and indexation play a strong role, a sensitivity of inflation to its forecast is statistically insignificant. This confirms the statement that the inflationary process in this country has not been strongly sensitive to future expectations, which is perhaps consistent with the pegged exchange rate regime. The new framework for the NBH monetary policy is likely to change this situation since it emphasizes the importance of inflation forecast and other forward looking variables for policy decisions. Current inflation is certainly sensitive to its most recent trend in all three countries. It is highly sensitive to the first order autoregressive process, thus it is certainly supported by strong, backward-looking indexation. Although the future inflation forecast is less significant, it is an important explanatory factor of inflation, primarily in Poland. As argued before, this stems directly from systemic foundations that decide how forward-looking expectations are transmitted into the inflation process. Polish firms and markets may be sensitive to

the expected inflation trend since the NBP widely applies a policy bias in monetary policy communication. It can be expected that inflation forecasts and rational expectations will play a more significant role in the future, as monetary policies become more transparent and, generally speaking, more credible.

The relationship between seasonally adjusted industrial production and the inflation process seems to be quite apparent, as also confirmed for Hungary by Siklos and Abel (2001). This suggests that a Phillips-curve-type relationship may be evident in these economies, at least in the short-run. Monetary easing (or tightening) seems to correspond with an increase (or slowdown) in industrial activity. For instance, in the Czech Republic, a significant and prolonged monetary tightening, particularly during the period between the third quarter of 1997 and the first quarter of 1999, had a strong, negative impact on the country's industrial output. A similar slowdown in output growth is observed in Poland in 2000 and 2001, in part because of the extremely tight monetary policy (which is evidenced by the high inflation risk premiums shown in Table 1). Interestingly, the data seem to indicate that the Phillips curve process is somewhat more pronounced under conditions of more flexible exchange rates in Poland and in the Czech Republic, than in Hungary.

Intriguing results are provided by the β_3 estimates. These coefficients show to what extent the expected trend in foreign (German) inflation is transmitted via variation in the current exchange rate onto domestic inflation. Evidently, the reactions of current inflation to the expected German inflation and to the exchange rate trend are quite different in these economies. The coefficient is statistically significant and has a positive sign for Hungary, meaning that increases in the EU, or more precisely, in German inflation expectations are transmitted to domestic inflation, particularly under the fixed exchange rate regime. In contrast, the coefficient is statistically significant; yet, it has a negative sign in the case of the Czech net inflation. This suggests frequent pre-emptive policy responses of the CNB to the expected external inflationary pressures.

It is rather perplexing that the real exchange rate movement in the preceding period has little impact on the inflationary process in all three countries. This suggests weaker pass-through effects of exchange rates into inflation than that claimed by both policy-makers and independent researchers (Szapáry and Jakab, 1998; Golinelli and Rovelli, 2001).

Short-term interest rate differentials do not appear to be seemingly related to the inflation process, with the exception of the Czech CPI inflation (as confirmed also by Matoušek, 2001). Their impact on inflation in Poland and in Hungary might be overrated in the official policy statements and central bank reports. Both countries are fairly well cushioned from large external speculative attacks, as proven by relative stability of their financial markets in the aftermath of the Asian and the Russian financial crises (Gelos and Sahay, 2000). But the weak connection between short-term market interest rates, suggests that calls for monetary policies that are based on interest rate targeting might be unsubstantiated; such policies are not likely to be effective in lowering inflation.

By comparison, differentials in bank lending rates in the preceding period do matter in the tested model. This is clearly the case in Hungary and, to a lesser degree, in Poland. They have also a somewhat pronounced impact on the Czech net inflation. The obtained results indicate that if domestic lending rates in the previous period are higher than the German lending rates, borrowers are likely to bring large amounts of credit from

German and other EU banks. Large inflows of foreign bank credit are likely to add to the ongoing inflation process in the examined transition economies. This factor deserves strong attention of central banks in these countries in their decisions about interest rate target levels.

The presented tests indicate that inflation in all three countries is strongly influenced by the autoregressive process. Current inflation is affected by the most recently observed trend and it might be also influenced by its dynamic trajectory, or the overall trend.

In order to detect a precise *pattern of inflation*, the estimates of which would be robust to heteroscedasticity and autocorrelation, a simplified inflation function can be estimated with a generalized method of moments (GMM). The specified estimated equation can be designed as a vector autoregressive function that includes the stochastic time trend:

$$\hat{\pi}_t = c_1 + c_2\pi_{t-1} + c_3\pi_{t-2} + c_4\pi_{TREND} \tag{16}$$

The GMM methodology allows for choosing a list of instrument variables the changes of which do not become autocorrelated with the residuals in the estimated inflation function (16). Therefore, in order to alleviate the problem of autocorrelation between these residuals and the changes in the key instrument variables of monetary policy, I have conducted the GMM estimation of (16) while selecting the nominal exchange rate, the short-term interest rate differential (with Germany) and the constant term as GMM instrument variables. In other words, the choice of exchange rates and interest rates as instrument variables allows for insulating inflation as the monetary policy goal from autocorrelation with the policy instruments. As before, the inflation trend is based on the Hodrick Prescott filter estimation.

The GMM results are shown in Table 4. The empirical estimation shows no significant revelations comparing to the previously obtained results. As proven before, the strongest accelerator (or decelerator) of inflation is its most recently observed tendency, or, in technical terms, the first order autoregressive process. The second order process has a somewhat reversed, corrective impact in current inflation, and the overall dynamic trend seems to play a less significant role. The different results between a forward looking (6 months ahead) trend in Table 3 and the GMM estimated dynamic trend in Table 4 seem to indicate autocorrelation between the trend inflation, and interest rate differentials and exchange rates.

Table 4: GMM Estimation of the Inflationary Process (16)

Coefficient⇓	**Poland's CPI Inflation**	**Czech CPI Inflation**	**Czech Net Inflation**	**Hungary's CPI Inflation**	**Hungary's CPI Infl. *no trend***
C_1	**-0.014** (0.280) (-0.049)	**-1.399** (2.246) (-0.623)	**-0.383** (1.317) (-0.291)	**-0.104** (0.869) (-0.119)	**0.021** (0.121) (0.175)

C_2	**2.339** (0.857) (2.728)	**2.792** (1.203) (2.321)	**1.978** ((0.470) (4.207)	**1.966** (1.230) (1.599)	**1.777** (0.220) (8.079)
C_3	**-1.432** (0.888) (-1.613)	**-1.966** (1.420) (-1.384)	**-1.095** (0.605) (-1.812)	**-1.444** (4.925) (-0.293)	**-0.782** (0.215) (-3.642)
C_{TREND}	**0.104** (0.094) (1.106)	**0.383** **(**0.583) (0.657)	**0.198** (0.453) (0.437)	**0.496** (3.956) (0.125)	**NA**
Adjusted R^2	**0.983**	**0.789**	**0.967**	**0.976**	**0.989**
Durbin Watson	**2.250**	**2.259**	**2.615**	**1.598**	**2.540**
***J*-statistics**	**0.0076**	**0.0035**	**0.0026**	**0.0022**	**0.0113**

Notes: Standard errors are reported in upper and t-statistics in lower parentheses. The GMM estimates are robust to heteroscedasticity and autocorrelation due to the selection of the time series (HAC) weighting matrix option. The estimation is based on the selection of the fixed (3) bandwidth, Bartlett kernel, with no prewhitening. The J-statistics reflect the minimized value of the objective function.

Source: Own calculations based on data as in Table 2.

The fairly robust statistical results of the autoregressive process with the trend for Poland and the Czech Republic are not confirmed for Hungary. However, a de-trended function reaffirms a strong role of the autoregressive process, which is taking place there as well. Thereby, the Hungarian inflation appears to be less connected with its dynamic path, which may be at least partially related to the NBH's highly discretionary monetary policy based on exchange rate targeting that prevailed in the investigated period of time between January 1995 and June 2001. As proven by Golinelli and Rovelli (2001), the stubbornly high Hungarian inflation is susceptible to systemic factors, such as the rate of crawling devaluation and the fiscal policy stance.

In general terms, the presented empirical analysis shows that inflation in the EU candidate countries does not very strongly depend on changes in financial variables, at least in the short-run. However, with the advancement of their inflation targeting regimes, such variables are likely to be increasingly inter-related with the inflation process.

V. Concluding Remarks

Optimal sequencing of changes in monetary policies among the candidate countries that is aimed at facilitating the process of the EU/EMU accession is a perennial topic of concern and discussion. In seeking to refine the presented theoretical framework and empirical analysis, I conclude that monetary convergence process is best served with policies based on flexible inflation targeting and it should end, perhaps a bit abruptly, with a leap to euroization. Policies to this end are entirely possible and can help reinforce commitment to disinflation and ensure achieving the goal of price stability over time.

They are likely to eradicate systemic problems with lowering inflation, including nominal indexation of wages and prices that still plays a strong role in these economies. As the above empirical evidence suggests, inflation in Central European transition economies is strongly influenced by the autoregressive process, or predominantly by backward-looking expectations that directly affect the scope of nominal indexation. It is also hardly a surprise that central banks in transition economies are concerned with defying fiscal dominance that at the present time seems to be threatening a further pursuit of disinflation.

In response to these problems, flexible inflation targeting seems to offer a viable policy framework that preserves autonomy of central banks and their full commitment to price stability. It is also likely to strengthen connection between inflation and key monetary policy variables, namely interest rates and exchange rate, thus to diminish the interference of exogenous factors such as fiscal dominance, political risk, administrative price adjustments, etc.

The factors disconnecting inflation from the monetary variables can have either a transitory or a more dynamic impact. Changes in administratively regulated prices or VAT adjustments are likely to have a transitory influence on inflation. They do not have to be considered by central banks in setting monetary policy goals and determining its tactics. A more permanent impact on the perseverance of inflation is linked to structural changes in the economy that cause changes in relative prices and add to inflation through the Balassa-Samuelson process. These factors cannot be directly influenced by central banks and they have to be incorporated into the policy goals and targets. If short-term, operating targets are too ambitious and ignore these factors, monetary policy may become too tight; it will lead inadvertently to large instability of output and exchange rates. For this reason, a framework of flexible inflation targeting that takes stable exchange rate into consideration is certainly more appropriate for the economies in transition.

Since the catching up and the BSE phenomena are likely to continue in the foreseeable future, it would be imprudent for transition countries to rush to the eurozone prematurely. They need to establish foundations of price stability and gain a sustainable degree of monetary credibility by 'internal means' or with autonomous monetary policies instead. Moreover, because of the persistence of structural and BSE factors in the EU candidate countries, the formal criteria of their accession to the EU and later to the EMU need to deviate from the rigor of the Maastricht Treaty. If the accession is to be completed within the next several years, the inflation convergence might be redesigned to accommodate these dynamic processes, for instance, set at a maximum of 1.5 percent above the overall HICP inflation in the eurozone, rather than above that of the three lowest inflation states.

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