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MONETARY CONVERGENCE AND RISK PREMIUMS IN THE EU CANDIDATE COUNTRIES

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"Monetary Convergence and Risk Premiums in the EU Candidate Countries"

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This study examines the link between various monetary policy regimes and the ability to manage inflation and exchange rate risk premiums in the EU candidate countries as they undergo monetary convergence to the eurozone. The underlying hypothesis is that a system of 'flexible inflation targeting' may be an optimal policy choice for managing these two categories of risk. A model of inflation and exchange rate risk premiums within the context of inflation targeting is proposed. Recent trends in these risk premiums in Hungary, the Czech Republic and Poland are tested by using the GARCH (1,1) methodology.

JEL classification: E32, E52, P33

Keywords: inflation risk premium, exchange rate risk premium, inflation targeting, monetary convergence, transition economies.

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I. Introduction

The candidate countries for accession to the European Union (EU) are presently revising their economic policies in the direction that will enable them to establish the framework of competitive market system that is compatible with that prevailing in the EU. Modifications in monetary and exchange rate regimes in these countries are crucial for their successful monetary convergence to the eurozone.

The key assumption underlying this analysis is that the candidate countries for the EU/EMU accession need to demonstrate capability to manage risk premiums, particularly the inflation risk, the exchange rate risk and the default risk premiums, as a necessary condition for their successful monetary convergence. They need to adopt an appropriate monetary policy that will facilitate management of these risk premiums in the most effective way.

In technical terms, monetary convergence of the candidates to the eurozone entails achieving some essential benchmarks for price stability, as well as interest rate and exchange rate stability that are consistent with the criteria outlined by the Maastricht Treaty. These criteria call for establishing predetermined targets of monetary stability that ought to be met upon the EU accession, and at the later stage, the subsequent entry to the EMU. These future targets can be and ought to be outlined at the present time, and because they pertain to the future ambitious benchmarks of low inflation, stable exchange rates and low interest rates, the monetary convergence strategies and policies ought to be forward-looking and highly transparent.

Possible choices for monetary convergence strategies have been widely discussed in the recent literature; they range from calls for a unilateral euroization at the earliest possible time (Begg et.al., 2001), to arguments favoring a more gradual path based on autonomous monetary policies such as flexible inflation targeting (Orlowski, 2001a and 2001b) or flexible exchange rate targeting (Bofinger and Wollmershäuser, 2001).

This study is based on the argument that monetary convergence of the candidates can be effectively achieved through relying on direct inflation targeting (DIT) rather than currency pegs. Consistently, the convergence process may be facilitated by policies which primary task is to dampen inflation, and only later to focus on exchange rate stability. A premature leap to unilateral euroization carries several important disadvantages. Most importantly, it is unlikely to resolve a critical issue of a default risk and it might even exacerbate it if the candidates' financial institutions are not adequately prepared for a head-on competition with their foreign counterparts. In essence, such early euroization means switching to the environment of:

a. considerably lower interest rates
b. weaker currency (the euro), since at the present time domestic currencies of the leading EU contenders are supported by very high interest rates, well above those prevailing in the eurozone

In principle, euroization might eradicate the inflation risk and the exchange rate risk premiums, without improving the default risk premium. (The latter is a direct function of improvements in corporate governance among domestic financial and business institutions, which may take some time to materialize in the EU candidate countries). Because of the prevalence of the default risk, monetary policy adjustments ought to be synchronized with institutional advancements, mainly in the financial sectors of the candidate countries. This can be accomplished by efforts aimed at mitigating inflation and exchange rate risk premiums.

I envisage monetary convergence to the eurozone as a two-step process. It shall first begin with strict inflation targeting (SIT) policies that are aimed solely on reducing inflation. Once a reasonable degree of price stability is achieved, the candidate countries may consider applying the second step of convergence, namely a flexible inflation-targeting (FIT) regime that will combine a predominant target of low inflation with a supporting target of exchange rate stability.

The underlying hypothesis for the empirical testing is that the candidates follow DIT regimes based on policy reactions to most recently observed inflation. Their preparation for the EMU entry will require adoption of a system of inflation-forecast targeting with a 'conditional' target of exchange rate stability. Following this premise, this study proposes a forward-looking model of managing inflation and exchange rate risk premiums vis-à-vis those prevailing in the eurozone, within the framework of strict and flexible inflation targeting regimes. The model is formalized in Section II. The empirical testing of the model for the leading EU candidates, namely, for Poland, Hungary and the Czech Republic, is presented in Section III. The central question for the empirical testing is whether the candidates have begun pursuing the monetary convergence process to the euro that follows the precepts of the presented model.

II. IRP-ERP Model

The connection between inflation and exchange rate risk premiums and choices of various monetary policy regimes is derived from the extensive theoretical discussion and empirical examination in the recent literature. The traditional approach to policies aimed at targeting inflation or price stability has focused on the volatility of output as a subsequent result or cost of reducing volatility of inflation (Svensson, 1999a). Nonetheless, a number of recent studies have emphasized the impact of inflation targeting on volatility of both real and nominal exchange rates. Specifically, Haldane (1997) presents compelling evidence that the inflation-targeting framework is likely to aggravate stability of exchange rates. In a similar vein, several models have focused on pass-through effects of currency depreciation on inflation (via rising import prices), as initiated by the seminal study by Ball (1999). Drawing on Ball's model, Eichengreen (2001) proves that possible shocks to pass-through effects are by their nature only transitory and they not require active policy responses. If such active responses prevail, they are likely to amplify the volatility of output and inflation. These findings are essentially in line with the classic Mundell-Flemming model, which implies that flexible exchange rates will dominate fixed rates if an economy is predominantly affected by foreign real shocks. Such policy models allow for designing a central bank's reaction (or loss) function focusing on the tradeoff between volatility of inflation and exchange rates[2].

Recent monetary policy models and empirical studies seem to reinforce the emphasis on the relationship between volatility of inflation and exchange rates. Among them, Gali and Monacelli (2002) demonstrate that the policy of inflation targeting as compared to price level (CPI) targeting or an exchange rate peg implies a substantially larger volatility of both nominal and real exchange rate. Similar results are proven

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[2] Various forms of central bank's reaction functions are proposed and exhaustively examined by Svensson (1999b).

empirically by Golinelli and Rovelli (2001) for the economies in transition. These authors demonstrate that a strong determination to dampen inflation, particularly in the case of Poland, contributes to trend real and nominal appreciation of domestic currencies. By comparison, Neumann and von Hagen (2002) prove empirically that the recent inflation targeting policies practiced by several central banks have not aggravated volatility of output. They have not been significantly successful in taming inflation relative to other leading central banks, particularly those that have focused on money growth targets, but they have contributed to substantial gains in monetary credibility. In sum, these findings point out that it is prudent to devise a reaction function for monetary policy that would combine the goals of lowering inflation ad reducing exchange rate volatility. I, thereby, follow up on this premise.

As assumed in this study, a successful monetary convergence of the EU/EMU candidates to the eurozone ought to focus on their ability to manage both the inflation risk premium (IRP) and the exchange rate risk premium (ERP). In an advanced policy scenario, monetary policies that are aimed at lowering both risk premiums need to be autonomous and forward-looking. Considering this premise, the inflation risk premium can be presented as:

$$i_t^d - \pi_t^d = i_{t+\tau/t}^* - \pi_{t+\tau/t}^* + \Phi_t \qquad (1)$$

where i_d^t is the domestic (short-term market) interest rate, π_t^d is domestic headline inflation at time t, $i_{t+\tau/t}^*$ is the target for domestic interest rate determined for τ -periods ahead at the present time and consistent with the corresponding inflation target $\pi_{t+\tau/t}^*$, and Φ_t is the inflation risk premium prevailing at the present time.

The IRP can be reiterated as

$$\Phi_t = (i_t^d - i_{t+\tau/t}^*) - (\pi_t^d - \pi_{t+\tau/t}^*) \qquad (2)$$

In this form, the IRP in the open-economy framework with forward-looking expectations is the difference between the interest rate differential and the inflation differential, both of which account for some future targets that are consistent with the corresponding variables forecasted for the common currency system. Moreover, aligning purely domestic inflation risk premium with the one expected to prevail in the common currency system is warranted by the conditions identified in the recent literature on ‘dollarization’ as prerequisites for entry into a common currency system. Specifically, Alesina and Barro (2001) emphasize that a successful entry into a common currency area requires well-established co-movements between key monetary variables of the candidate and of the common currency bloc.

The exchange rate risk premium (ERP) can be derived from the simplified version of the purchasing power parity (PPP) condition in the framework of an open economy that is pursuing active convergence to the common currency system. Accordingly, the inflation target for this economy $\pi^*_{t+\tau/t}$ is consistent with the forecasted inflation in the common currency system (the eurozone) and the exchange rate target $e^*_{t+\tau/t}$ is conditional upon the inflation target. Under these circumstances, the ERP can be stated as

$$e_t - e^*_{t+\tau/t} = \pi^d_t - \pi^*_{t+\tau/t} = \Psi_t \tag{3}$$

where Ψ_t reflects the ERP.

In order to ensure a full consistency between monetary policy instruments and goals in the open economy framework, the ERP needs to satisfy also the international Fischer effect (IFE) condition

$$e_t - e^*_{t+\tau/t} = i^d_t - (i^*_{t+\tau/t} + \Psi_t) \tag{4}$$

The monetary policy instrument rule derived from (2) can be specified as

$$i^d_t = i^*_{t+\tau/t} - \pi^*_{t+\tau/t} + \pi^d_t + \Phi_t \tag{5}$$

The inflation targeting instrument rule (5) reflects a forward-looking strict inflation targeting system in an open economy in which target variables for interest rates and inflation become exogenous. The interest rate rule (5) inserted into (4) gives

$$e_t - e^*_{t+\tau/t} + \Psi_t = \pi^d_t - \pi^*_{t+\tau/t} + \Phi_t \qquad (6)$$

The relationship between ERP and IRP that is shown in (6) reflects policy choices in the forward-looking setting since policy monitoring focuses on the differences between current inflation and exchange rates and their respective target levels for the τ -periods ahead. Translating this relationship into the framework of monetary convergence to the common currency system implies that the current exchange rate e_t is expected to converge to the exchange rate target $e^*_{t+\tau/t}$ and the current inflation π^d_t will be also moving closer to the inflation target $\pi^*_{t+\tau/t}$. In order to accomplish these tasks, the candidates will have to focus on improvements in policy credibility and in the overall stability of their financial system that will eradicate both the ERP (Ψ_t) and the IRP (Φ_t).

As proposed in this study, a proper sequencing of such policy should follow a two-step process, which at the initial stage relies on minimizing the IRP and reducing it to a predetermined target that can be specified as $\overline{\Phi}_{t+\tau/t}$. Only later when this target is fully accomplished, the monetary authority will be able to apply the advanced stage by redirecting efforts onto achieving the exchange rate target that can be specified as $\overline{\Psi}_{t+\tau/t}$. In practical terms, these tasks may be accomplished by applying a policy convergence process that begins with a SIT approach, followed a combination of inflation targeting with some attention to exchange rate stability within the FIT framework, and ended by some form of exchange rate targeting in the form of a hard peg or preferably a full euroization.

Taking into consideration the proposed sequence of monetary convergence, policy makers will need to devise corresponding rules for strict and flexible forward-looking inflation targeting regimes. The interest rate rule within the SIT forward-looking framework can be derived from (5) and prescribed as

$$i_t^d - i_{t+\tau/t}^* = \pi_t^d - \pi_{t+\tau/t}^* + \Phi_t \tag{7}$$

Within this policy framework, the central bank will adjust the difference between the current interest rate and the implied target rate for monetary convergence. The difference is based exclusively on the deviation between the actual and the target inflation, taking into consideration the prevailing inflation risk premium. This premium can be lowered along with gains in monetary policy credibility, as financial markets perceive them. Once the prevailing Φ_t converges into the IRP target $\overline{\Phi}_{t+\tau/t}$ that is required for accession to the common currency system, policy makers may decide to switch into the FIT framework that gradually pays more attention to the exchange rate stability. Subsequently, the instrument rule can be modified as

$$i_t^d - i_{t+\tau/t}^* = \delta(\pi_t^d - \pi_{t+\tau/t}^* + \Phi_t) + (1-\delta)(e_t - e_{t+\tau/t}^* + \Psi_t) \tag{8}$$

The forward-looking FIT regime will initially begin from a stronger weight δ assigned to the deviation of actual inflation from the forecast, or convergence target level. If the IRP falls to the satisfactory level, the central bank will choose to increase the policy emphasis on the exchange rate stability target (by reducing δ). Realistically, the new targeting formula will enable the monetary authority to reduce the ERP to the level that will ensure a smooth entry to a common currency system.

The process of monetary convergence that begins from SIT and is followed by FIT becomes perhaps more lucid and easier to interpret if it is presented graphically (Figure 1).[3]

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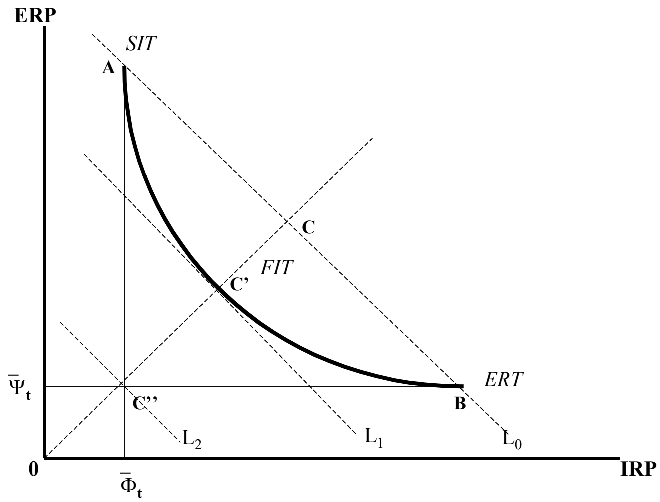
[3] The presented model is an updated and extended version of the one initially proposed in Orlowski (2001a).

Figure 1: The Inflation Risk Premium (IRP) and the Exchange Rate Risk Premium (ERP) in the Direct Inflation Targeting (DIT) vs.Exchange Rate Targeting (ERT) Framework



In the scenario outlined in Figure 1, the central bank begins the convergence process at point A reflecting a strict inflation target system that is aimed solely at dampening the inflation risk premium to the target level $\overline{\Phi}_t$, which might be consistent with the common currency area entry target $\overline{\Phi}_{t+\tau/t}$. However, the initial containment of inflation may result in large variability of the exchange rate or, in other words, in a large and excessive ERP. To resolve this issue, the central bank will decide to change its policy approach into FIT that emphasizes reduction of both the IRP and the ERP. The combination of IRP and ERP may get settled at point C, which denotes reaching a high degree of both risk premiums. Point C is located on the same credibility locus L_0 as the initial point A, thereby both points are located on the worst possible credibility scenario in the presented model. Switching the policy to FIT and reaching 'only' a combination of high inflation and exchange rate risk premiums at point C epitomizes a failure of FIT to reduce both risk premiums. FIT becomes partially successful in lowering the ERP and IRP when point C' is reached, since this point is located on a better credibility locus L_1. Ideally, FIT will help finalize the convergence process if both premiums are reduced to C'' thus to the respective target levels at $\overline{\Phi}_t$ and $\overline{\Psi}_t$. Point C'' lies on the L_2 locus that reflects best possible credibility gains, which are satisfactory for entry into the common currency system. By assumption, although the origin (point 0) of this ERP-IRP tradeoff reflects a fully successful convergence of both risk premiums to their respective levels that prevail within the common currency system, their $\overline{\Phi}_t$ and $\overline{\Psi}_t$ targets can be viewed as sufficient for a formal accession.

The empirical assessment of monetary policy adjustments focuses on the central bank reaction function that is prescribed by the non-linear trajectory AC'B outlined in Figure 1. This path of policy change can be formulated as a reciprocal function

$$\Psi_t = 1/\Phi_t \tag{9}$$

In terms of definitions of these risk premiums identified by (2) and (3) it may be stated as

$$e_t - e^*_{t+\tau/t} = 1/\left[\left(i^d_t - i^*_{t+\tau/t}\right) - \left(\pi^d_t - \pi^*_{t+\tau/t}\right)\right] \tag{10}$$

However, with no apparent credibility gains, the relationship between Φ_t and Ψ_t may follow a linear and down-sloping pattern such as L_0. Thereby in general terms, the relationship between both risk premiums can be stated as

$$e_t - e^*_{t+\tau/t} = \alpha\left[(i^d_t - i^*_{t+\tau/t}) - (\pi^d_t - \pi^*_{t+\tau/t})\right] \tag{11}$$

This basic, forward-looking relationship between ERP and IRP may provide helpful guidance for the candidate countries for accession to the EU, and at a later stage, to the EMU. It may serve as a guidepost for outlining their monetary convergence criteria and optimal policies.

III. Interdependence between IRP and ERP in EU Candidate Countries

The empirical investigation of the proposed model focuses on addressing two points; it attempts to answer whether there is:

1. a path-dependent relationship between both risk premiums,

2. a simultaneous decline in both the IRP and the ERP that would prove a successful pursuit of monetary convergence to the eurozone.

Since both investigated variables represent two diverse components of financial risk, it is appropriate to evaluate volatility of both the exchange rate of national currencies expressed in euros and to use the interest rate differential adjusted for inflation differential vis-à-vis Germany, as a proxy for the inflation risk premium. For the purpose of empirical investigation, the model prescribed by (11) is simplified and adjusted to contemporaneous variables only, since the preliminary tests have shown that the underlying monetary policies in the three examined countries do not have a forward-looking character. Thus the time series expression of IRP as a function of ERP is stated as

$$\left[(i_t^d - i_t^{GER}) - (\pi_t^d - \pi_t^{GER})\right] = \beta_0 + \beta_1 e_t + \mu_t \qquad (12)$$

where superscripts GER denote the corresponding German short-term interest rates and inflation rates. Equation (12) allows for a rough approximation of co-movements between exchange rates vis-à-vis the euro and inflation risk premiums relative to those prevailing in Germany.

The recent practical experience of the leading EU candidates suggests that both the IRP and ERP time series are likely to display high volatility and instability of error terms. It is because the examined economies of Poland, Hungary and the Czech Republic are all susceptible to contagion effects of external financial crises that entail temporary, uneven shocks to both risk premiums and instigate diverse monetary policy responses. The unstable effects of temporary shocks to risk premiums introduce heteroscedasticity to the investigated relationship, which in essence precludes using parametric (OLS) methods of estimation. Due to the expected prevalence of heteroscedasticity, the *generalized auto-regressive conditional heteroscedasticity* - GARCH (1,1) estimation technique is chosen in order to assess the link between the IRP and the ERP in all three countries. The headline CPI inflation and three-month Treasury bill rates are used in all three cases in order to ensure comparability of data. The time series begins as of January

1995 and ends in March 2002; the preceding period of economic transition (1990-1994) is cut-off to account for distinctively different monetary policies that were based on currency pegs at that time. A possible inclusion of that period would introduce a strong bias of a stable exchange rate and low ERP – a situation not fully comparable to the recent autonomous policies based on DIT in the Czech Republic, Poland, and Hungary[4].

The GARCH (1,1) model uses the conditional variance, which is the one-period ahead forecast variance based on past information[5]. The GARCH specification of the investigated relationship between IRP and ERP is

$$\Phi_t = \Psi_t \gamma + \varepsilon_t \tag{13}$$

as well as the function

$$\sigma_t^2 = \varpi + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 \tag{14}$$

The lag of the squared residual ε_{t-1}^2 from the mean equation is the ARCH term and it represents news about volatility of IRP from the previous period. The GARCH term σ_{t-1}^2 reflects the impact of the forecast variance in the preceding period on the current period variance.

The estimation representations of GARCH (1,1) effects of equation (12) for Hungary are shown in Table 1. The test indicates that the strong negative relationship between IRP and changes in the exchange rate (the euro value of the Hungarian forint) can be explained in terms of active policy responses aimed at stabilizing the exchange rate. This is understandable since the Hungarian monetary policy almost through the entire duration of the investigated period was geared toward exchange rate targeting. It was based on the crawling peg system of the forint vis-à-vis the euro exchange rate with a 2.25 percent tolerance band around the central parity rate, and accompanied by a crawling devaluation. The crawling peg regime was eventually abandoned with the

[4] For a detailed description of recent inflation targeting regimes in the Czech Republic, Poland and Hungary see for instance, Orlowski (2001a and 2001b), and Schaechter, Stone and Zelmer (2000).
[5] Engle (2001) provides a comprehensive, yet simple and useful description of ARCH and GARCH models, emphasizing their applicability to the examination of risk in financial analysis.

formal introduction of DIT in June 2001 (although the crawling devaluation was given up only in October 2001). Since then, the National Bank of Hungary has applied a flexible inflation targeting system with clearly specified intermediate and operating targets for CPI inflation, and a supporting target of exchange rate stability. The intermediate inflation target has been set at 2.0 percent to be reached by the 1st quarter of 2004, that is two years prior to the intended EMU entry as of January 2006. The year-end operating target range for December 2001 was 6.0-8.0 percent, and the actual inflation rate ended up at 6.8 percent, slightly below the target's midpoint. The target for December 2002 is set at the ambitious range of 3.5-5.5 percent, which reaffirms commitment of the Hungarian central bank to disinflation and calls for a high degree of monetary and fiscal discipline. As a supporting target, Hungary has applied an ERM2-resembling system as of October 2001. The central reference rate of the euro in forint terms has been set at 276.1 (forint-per-euro) with a 15 percent band of permitted fluctuations on either side of the central parity. The new DIT strategy is certainly implemented through a considerable monetary tightening, which in combination with the continued strong capital inflows results in the nominal and real appreciation of the Hungarian currency. (Specifically, by mid-May 2002 the forint ended up 11.2 percent stronger than the reference rate).

Table 1: GARCH (1,1) Effects of the IRP-ERP Relationship (Equation 12) for Hungary. (Based on January 1995-March 2002 Data)

	Coefficient	*standard error*	*z-statistics*	*Probability*
e_t	**-1693.28**	**127.28**	**-13.30**	**0.000**
constant term	**6.94**	**0.58**	**11.91**	**0.000**
Variance equation (14):				
Const.	**0.244**	**0.236**	**1.033**	**0.302**
ARCH-term	**1.188**	**0.382**	**3.110**	**0.002**
GARCH-term	**0.023**	**0.119**	**0.196**	**0.845**
Adjusted R^2 = -0.13 Mean IRP = -0.054 St.dev. of IRP = 2.074 AIC = 3.857				

Notes: the ARCH term is ε_{t-1}^2 and the GARCH term is σ_{t-1}^2 from equation (14); AIC is the Akaike Information Criterion.

Source: author's own calculations, based on the National Bank of Hungary and the IMF data.

In addition, the empirical test shows strong ARCH effects on IRP, meaning that the Hungarian inflation risk has been strongly influenced by the news and the effects from the preceding period. This implies a highly proactive, discretionary approach to monetary policy by the National Bank of Hungary. Another interesting and perhaps a bit surprising observation is a low and negative mean value of the IRP relative to Germany, proving that the overall Hungarian monetary policy has been relatively expansionary. One possible reason for it would be the need to gear policy instruments to the weakened exchange rate through the crawling devaluation mechanism in the presence of strong capital inflows that the country in fact experienced in the second half of the 1990s. Low interest rates and strong capital inflows undeniably contributed to the persistently high inflation. Consequently, the combination of low interest rates aimed at sustaining the weak exchange rate and tenaciously high inflation had to result in the low IRP.

The test also proves that the interactions between IRP and ERP have not been strong, as implied by a high value of AIC. Both risk premiums have been moving so far rather independently. The IRP became clearly elevated in relation to the ERP during the three distinctive periods that are detected from the graph displaying recursive residuals to the investigated GARCH series (Figure 2).

Figure 2: Distribution of Recursive Residuals of the GARCH (1,1) Estimation of the IRP-ERP Model (Equation 12) for Hungary.

…………… insert Figure 2 here ……………………….

Source: author's own estimation.

The first period of apparent pressures on IRP relative to ERP corresponds with the contagion effects of the Czech (mid-1997) and the Asian (mid-1997 to mid-1998) financial crises. In response to these pressures, the National Bank of Hungary resorted to applying a somewhat tighter monetary policy relative to that prevailing in the overall investigated period in order to cushion the apparent contagion effects of both crisis episodes. As the recursive residuals distribution shows, the response to the contagion effects following the Russian financial crisis of September 1998 was even stronger. The Hungarian central bank reacted to this crisis by raising interest rates (unlike the National Bank of Poland that cut the rates in order to signal 'de-coupling' of Poland's economy and financial markets from Russian problems). As a result, Hungary's IRP increased relative to the ERP. The third period of stronger pressures on IRP coincides with the introduction of DIT. Clearly, in order to properly implement the DIT strategy, the National Bank of Hungary has moved to a tighter monetary policy stance. As indicated above, this restrictiveness is constrained by the strong nominal and real appreciation of the forint.

A seemingly different relationship between IRP and ERP prevails in the Czech Republic. As shown in Table 2, both risk premiums display a positive relationship there, indicating that monetary tightening resulting in higher IRPs induced the Czech koruna appreciation. This is not a surprising result taking into consideration the prevailing monetary regime during the investigated period. In place of the previous soft peg of the koruna, the Czech National Bank applied strict inflation targeting as early as in January 1998 allowing the currency to float. The DIT regime was initially supported with very high real interest rates (thus high IRP) and it has been successful in generating the lowest overall inflation among the three examined countries. At the present time, the intermediate inflation target in the Czech Republic is set at 2.0 percent net inflation to be reached by the end of 2005 (right before to the intended EMU entry in January 2006). Operating targets follow a carefully designed linear trajectory of CPI inflation that is subject to monthly monitoring; they are not specified on the year-end basis. In essence, the positive relationship between IRP and ERP in the Czech Republic indicates feedback effects of exchange rates to changes in interest rates that have been aimed primarily at taming inflation.

Table 2: GARCH (1,1) Effects of the IRP-ERP Relationship (Equation 12) for The Czech Republic. (Based on January 1995-March 2002 Data)

	Coefficient	*standard error*	*z-statistics*	*probability*
e_t	**252.90**	**81.42**	**3.11**	**0.002**
constant term	**-7.98**	**2.28**	**-3.49**	**0.001**
Variance equation (14):				

Const. **ARCH-term** **GARCH-term**	**0.246** **0.866** **0.115**	**0.142** **0.466** **0.225**	**1.735** **1.856** **0.511**	**0.083** **0.063** **0.609**
Adjusted R^2 = -0.24 Mean IRP = 0.070 St.dev. of IRP = 2.305 AIC = 3.715				

Notes: as in Table 1.

Source: author's own calculations, based on the Czech National Bank and the IMF data.

The GARCH test for the Czech Republic also shows prevalence of ARCH effects, although they are somewhat weaker than in the case of Hungary. The news from the previous period do play some role in the underlying IRP changes in the Czech system. The GARCH effects are rather undefined and unstable. Noticeably, the sum of coefficients of ARCH and GARCH terms is close to unity indicating a high persistence of the IRP process. Unlike in Hungary, the overall (the mean) IRP in the Czech Republic is positive, although quite low. It implies that the degree of tightness of the Czech monetary policy relative to that of Germany (the Bundesbank) and, after the eurozone inception, of the European Central Bank has been rather mild. However, this does not mean that the Czech National Bank has been responding closely to the monetary conditions prevailing in the eurozone. The high standard deviation of IRP fluctuations relative to the mean reflects considerable instability of this pattern.

There have been at least two major deviations from the overall path of IRP relative to ERP in the Czech Republic, which can be detected in Figure 3. Strong upward pressures on the IRP were apparent around the time of the country's financial crisis in 1997 (Brada and Kutan, 1999). Such pressures became even stronger during the one-year period following the introduction of DIT in January 1998. Concurrently with the inception of the new monetary regime, the Czech Finance Ministry raised administratively regulated prices of energy, fuel, transportation and other strictly controlled items. This action elevated inflation expectations and it could seriously undermine the effectiveness of the new DIT policy (Matoušek and Taci, 2002). As a result, the Czech National Bank was forced to respond with very high interest rates that persisted during the whole year of 1998. These high interest rates directly contributed to the upsurge of IRP relative to ERP, as shown in Figure 3.

Figure 3: Distribution of Recursive Residuals of the GARCH (1,1) Estimation of the IRP-ERP Model (Equation 12) for the Czech Republic.

…………… insert Figure 3 here ……………………….

Source: author's own estimation.

A different set of monetary conditions is displayed by the GARCH analysis for Poland (Table 3). The striking difference comparing to the two previous cases is the very high, positive mean value of the IRP implying a persistently tighter stance of Poland's monetary policy. Thus disinflation and monetary convergence in Poland has been so far implemented through considerably higher inflation risk premiums than those in the neighboring EU candidate countries. This situation indirectly implies that Poland's monetary policy and convergence are yet to gain the 'foundational credibility' as it is prescribed by this study.

Table 3: GARCH (1,1) Effects of the IRP-ERP Relationship (Equation 12) for Poland. (Based on January 1995-March 2002 Data)

	Coefficient	*Standard error*	*z-statistics*	*probability*
e_t	**-79.14**	**8.57**	**-9.24**	**0.000**
constant term	**24.51**	**2.19**	**11.18**	**0.000**
Variance equation (14):				
Const.	**0.586**	**0.328**	**1.786**	**0.074**
ARCH-term	**1.056**	**0.402**	**2.625**	**0.009**
GARCH-term	**-0.008**	**0.148**	**-0.054**	**0.957**
Adjusted $R^2 = 0.19$ Mean IRP = 4.436 St.dev. of IRP = 4.438 AIC = 4.754				

Notes: as in Table 1.
Source: author's own calculations, based on the National Bank of Poland, the Central Statistical Office in Warsaw and the IMF data.

In a similar vein to the previous cases, the Polish IRP relative to ERP is strongly influenced by the ARCH-term proving that the inflation and exchange rate risk premiums in Poland follow a highly persistent first-order autoregressive process. Unlike in the Czech case, but in a similar pattern to that of Hungary, there is an inverse, significant relationship between both risk premiums. This demonstrates that strong and high IRPs were accompanied by the overall volatility of the Polish zloty during most of the investigated period, perhaps with the exception of their reactions in 2001-2002. This situation reflects the apparent monetary policy struggle to lower inflation, reduce interest rates and, at the same time, to strengthen the domestic currency. So far, the decisive efforts of the National Bank of Poland to contain the IRP have not been accompanied by a simultaneous success in lowering the ERP. In general terms, the inverse relationship between IRP and ERP indicates that Poland's monetary policy is strictly aimed at disinflation and it may not be fully credible, at least in the perception of foreign exchange market participants. These reactions are understandable since Poland is still pursuing a strict variant of inflation targeting. The DIT regime began there in January 1999. At the present time, the intermediate target for CPI inflation has been set at 4.0 percent to be reached by the end of 2003. Operating targets have been determined on the year-end basis, with the more recent ones set for December 2001 at 6.0-8.0 percent and for December 2002 at 4.0-6.0 percent. The actual year-on-year CPI inflation reached 3.6 percent in December 2001, well below the operating target. It seems to be settled at a low, sustainable level, scoring merely 3.3 percent in March 2002.

There have been two distinctive periods of surging IRPs relative to ERPs in Poland, as demonstrated by the distribution of recursive residuals of the GARCH estimation (Figure 4). The first period corresponds with the reactions to contagion effects of the 1997 financial crises and it roughly coincides with the developments in Hungary and in the Czech Republic. However, the disturbances responding to the Russian crisis are seemingly absent in Poland, quite contrary to those observed in the remaining two countries. As explained above, the National Bank of Poland correctly chose to cut interest rates in order to underpin 'de-coupling' of the Polish system from the Russian troubles. However, during that period high IRP were not particularly helpful for reaching operating inflation targets; the actual inflation exceeded the upper boundaries of both 1999 and 2000 operating targets by wide margins (by 2.0 and 1.7 percent respectively). The inflation persistence induced the National Bank of Poland to apply extremely high target interest rates that elevated the IRP premium well above the investigated path. In essence, the claims that such high real interest rates were excessive shall be viewed as justifiable, as proven also by Golinelli and Rovelli (2001). They could have been lowered to the level that would bring the IRP in line with the ERP.

Figure 4: Distribution of Recursive Residuals of the GARCH (1,1) Estimation of the IRP-ERP Model (Equation 12) for Poland.

…………… insert Figure 4 here ……………………….

Source: author's own estimation.

In sum, the presented tests show that the three candidate countries are yet to follow the FIT policy framework outlined in the model prescribed in this study. The IRP-ERP relationships are still a bit ambiguous and not very robust, as proven at least by low AIC indicators. The Czech Republic seems to be most successful in lowering both risk premiums simultaneously, which proves that the Czech DIT strategy has been at least partially successful in facilitating both tasks of monetary convergence to the euro, that is the lower IRP and ERP.

IV. Concluding Remarks

This study proposes the path of monetary convergence of the EU/EMU candidates that emphasizes accomplishing two primary objectives, namely, a reduction of both the inflation risk premium and the exchange rate risk premium. It argues that the candidate countries should begin the convergence process with the emphasis on disinflation by applying a strict inflation targeting policy. Once a satisfactory level of price stability is achieved, the candidates might consider applying a more flexible approach to inflation targeting according to which the primary inflation targets are accompanied by the exchange rate stability targets. Such approach can be reasonably expected to enable the candidates to reduce simultaneously the IRP and the ERP[6].

The presented empirical tests show that the candidate countries have not been seemingly successful in lowering both categories of risk premiums at the same time. It is because the monetary authorities of all three countries have strongly emphasized reaching the goals of price stability and by doing so, they might have exacerbated exchange rate volatility. In addition, their policy efforts have been impaired, as they felt compelled to respond to strong contagion effects of international financial crises. Such actions elevated IRPs in these countries, particularly in 1997 and 1998.

By emphasizing both the disinflation and the exchange rate stability targets, the proposed regime of flexible inflation targeting is likely to lower both the inflation risk and the exchange rate risk premiums. Therefore, it can be viewed as a prudent and viable policy alternative that will enable the candidates to facilitate efficiently the process of monetary convergence to the eurozone.

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[6] The presented policy recommendations may be feasible for the candidate countries with fairly well developed financial markets, such as Poland, Hungary and the Czech Republic, while it may not be suitable for smaller states (i.e, the Baltic Countries) that are advised to pursue currency board arrangements on their path to the euro instead. It is because inflation-targeting policies require proper signals about the behaviour of monetary variables, which can be extracted from advanced and competitive financial markets. In addition, implementation of such policies can be only exercised through open market operations that also require sufficiently well developed financial markets.

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Figure 2

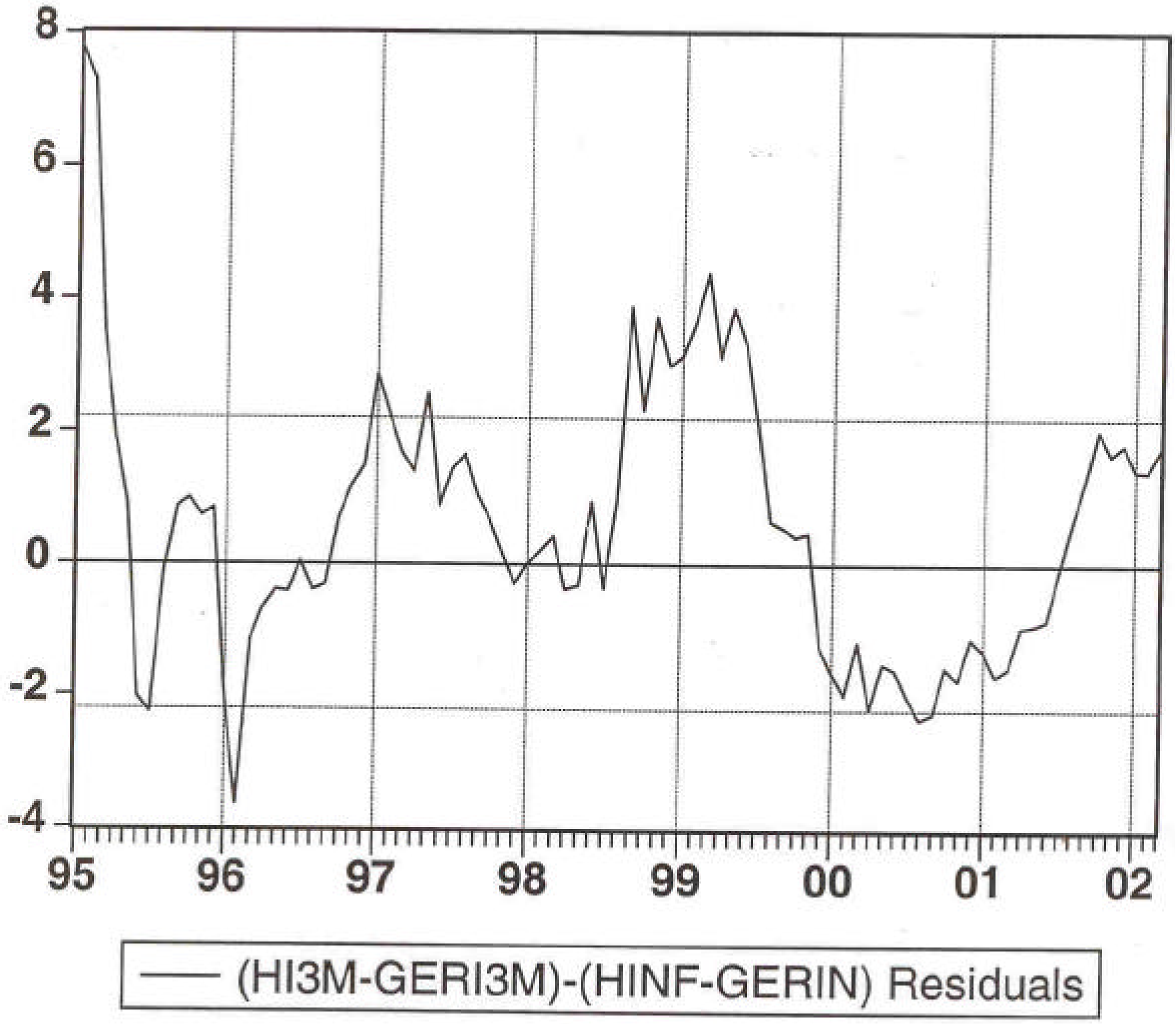
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Figure 3

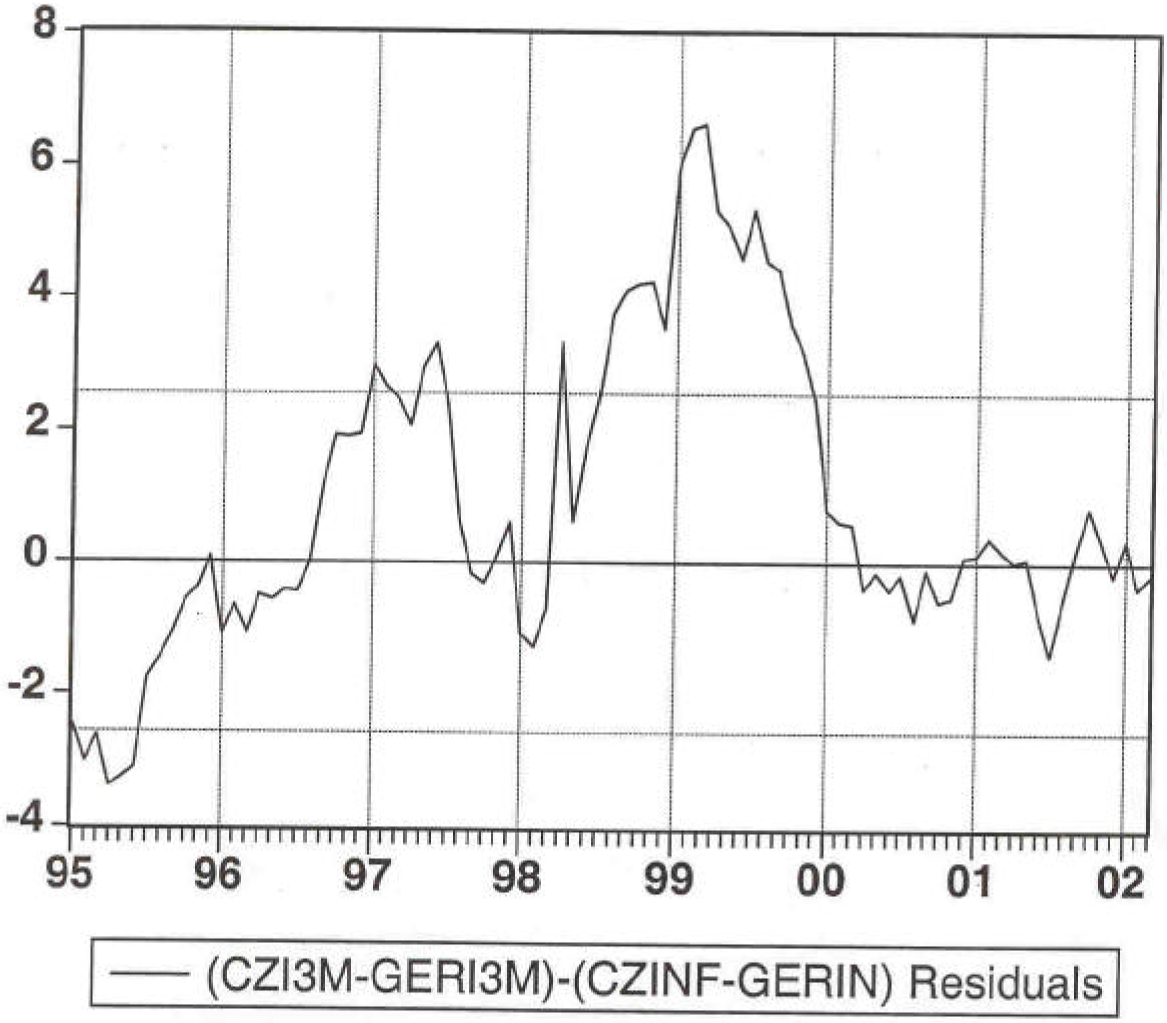
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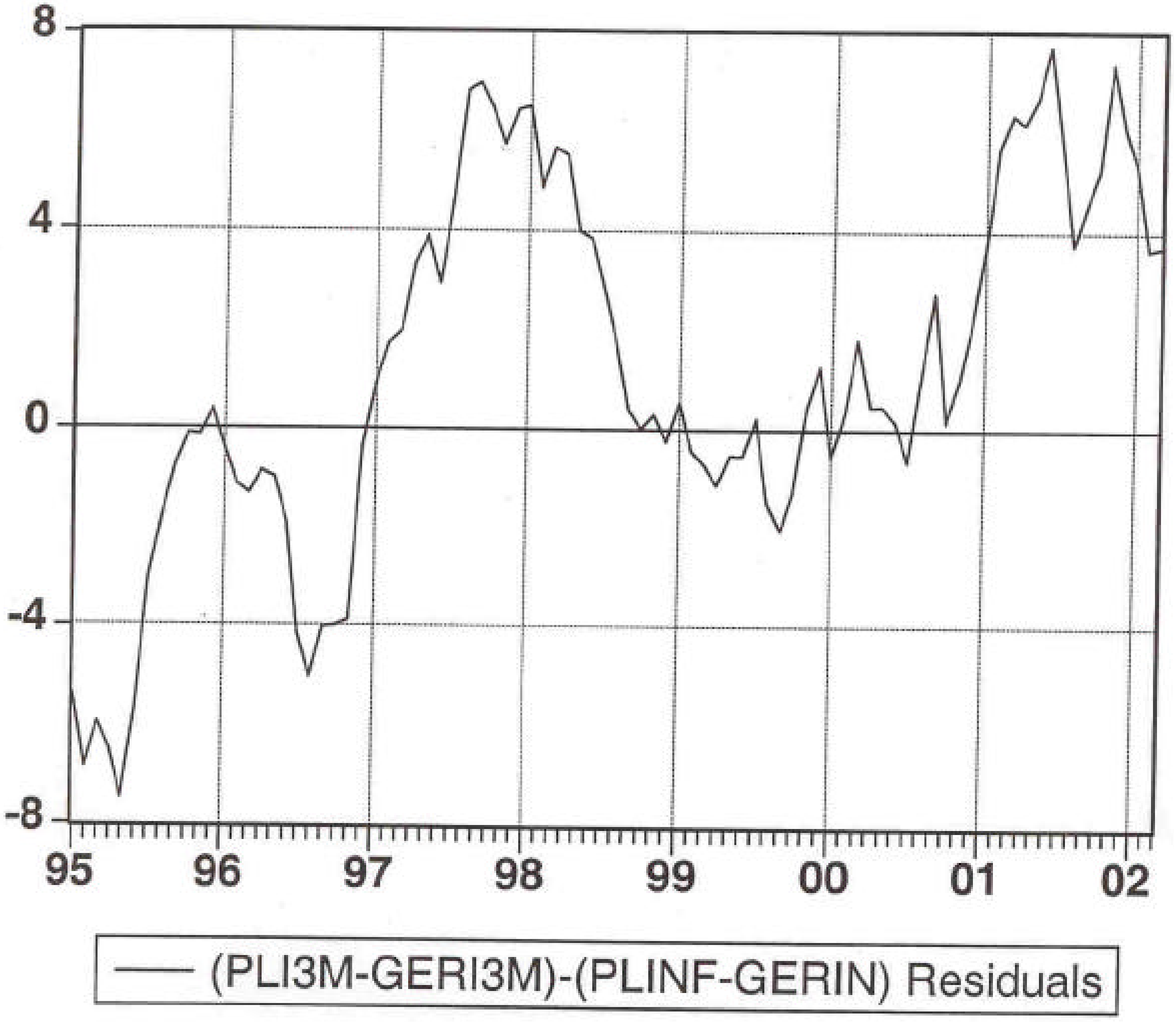
Figure 4



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