INFLATION TARGETING IN POLAND – A comparison with the Czech Republic

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Abstract

This paper deals with the implementation of the inflation targeting regime in Poland. The study contributes to the discussion about opportunities and constraints of inflation targeting in the more advanced transition economies. This analysis of monetary policy issues is based on an econometric investigation of the Polish inflation time series and on the estimation of the links between monetary policy instruments and inflation. In comparison with the Czech Republic, the Polish inflation targeting strategy faces more obstacles and limitations that are caused by the structural characteristics of Polish inflation and the country's less advanced money market.

Keywords: Central bank; Poland; Disinflation, Inflation targeting, crawling peg.
JEL classification numbers: C22, E52, E58, P33.

1. Introduction

The recent literature on direct inflation targeting is mostly based on the experience of developed countries(see, for example, Bernanke, 1999 and Svensson, 2000). Nevertheless, in the transition economies, a typical goal of monetary policy is to disinflate instead of stabilising low inflation. Under these circumstances, direct inflation targeting may be a better monetary policy strategy than using intermediate targets, since it offers two important benefits: increased control over inflation expectations and short-term flexibility. Therefore, the goal of this text is to assess the implementation of the inflation targeting regime and its applicability as a strategy for central banks in advanced transition countries which seek to converge domestic inflation to the European Union level.

The implementation of the inflation targeting regime in advanced transition economies was partly analysed by Christoffersen (1999), Gottschalk and Moore (1999), and notably by Orlowski (1999, 2000). This paper extends previous research with an analysis of monetary policy issues applying both the usual available data and the results of econometric analysis. Moreover, I focus on a comparison of the initial conditions for the successful inflation targeting strategy and the final shape of this monetary policy strategy in the Czech Republic and Poland. In addition to the analysis of inflation targeting, I

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attempt to explain the reasons behind different economic developments in Poland and the Czech Republic, most notably during the period of the global financial market gyrations in the first half of 1997.

The paper is organised in the following way. Section 2 briefly describes the history of Polish monetary policy. Section 3 characterises the main features and issues of inflation targeting in Poland. This section also examines the technical characteristics of inflation targeting focusing on the statistical attributes of Polish CPI inflation. Although these results are not definite, they provide some information to make a preliminary evaluation of the applicability of an inflation targeting regime in a transition economy. For the purpose of comparison, I will also present an empirical analysis of inflation in the Czech Republic as the second inflation targeting country among the CEECs. Section 4 deals with practical experiences with the inflation targeting strategy in Poland. Section 5 provides some concluding remarks and recapitulation of outcomes.

2. History of Polish Monetary Policy

In January 1990, the Polish authorities adopted a fixed exchange rate of the zloty against the US dollar. The growth of the monetary aggregate M2 was defined as the intermediate objective of monetary policy. The initial price liberalisation of 1989 and the abolition of most price controls in January 1990 increased consumer prices by more than 1100 per cent during the first half of year 1990. Nevertheless, the initial efforts of price stabilisation successfully cut CPI inflation to under 100 per cent by early 1991.

The excessive appreciation of the real exchange rate of the zloty, which deteriorated the external position of the Polish economy, led the Polish authorities to monetary policy changes. In May 1991, the zloty was first devaluated by 17 percent against the dollar and then pegged to a basket. Then, in October, the fixed peg was replaced by a crawling peg regime, initially with a 1.8 percent monthly crawl rate. The preannounced rate of crawl, that was substantially less than the expected change in prices, helped moderate price increases but the disinflation path, in accordance with the Polish authorities' ambition, became more gradual. The general government deficit, which was fluctuating around 3 per cent of GDP, was financed mainly by domestic borrowing. Under these circumstances, the interest rates stayed high and, with accommodative capital inflows, the pace of disinflation was gradual. During the year 1993, the annual CPI inflation fell below the 40 per cent rate, and through 1995 fluctuated around 30 per cent (see Figure 1). During this period, pervasive wage-price indexation, domestic producer prices, and the adjustment of officially controlled prices were the main sources of Polish inflation.

Through the 1990s, the rate of crawl was periodically reduced. In 1997, the rate of crawl exceeded the monthly inflation rate, while nominal interest rates were increased sharply. The National Bank of Poland (NBP) gradually enhanced the degree of exchange rate flexibility. In 1995, the zloty was allowed to fluctuate within ±7 per cent of its central parity. In February 1998, the fluctuation band was widened to ±10 per cent and the monthly rate of crawl slowed to 0.8 per cent. In this stage of the NBP's monetary policy, the crawling band regime played an important role in lowering a relatively high inflation rate (round 30 per cent) to a one-digit rate.

The domestic money market rates fell steadily through the years 1991 and 1992 as inflation declined. In 1993, the National Bank of Poland figured that the domestic money market had become advanced enough to use the short-term money market interest rates as an operational target of monetary policy. But in December 1995, the NBP adopted reserve money as its chief operational target and three years later, in February 1998, switched back to targeting short-term interest rates.

During the period of the global financial market gyrations in the first half of 1997, the zloty, managed via a crawling band arrangement with the ±7.0 percent fluctuation band, and with a central rate that depreciated by 1 percent a month throughout 1997, moved on the weak side of parity, while the Czech koruna was hit by an exchange rate crisis. The following description of economic conditions in both countries in the period prior to the financial crisis may shed light on the reasons behind the different behavior in these financial markets. In comparison with the Czech National Bank, the NBP preferred to maintain the international competitiveness of the Polish economy through real exchange rate stabilization. The CNB proved to be a conservative central bank which emphasized anti-inflation policies. The Czech strategy was accompanied by a real appreciation of the Czech koruna (CZK), thereby resulting in some loss in the international competitiveness of the Czech economy. In addition, the more favorable nature of the capital flowing into the Polish economy, considering the high share of non-debt creating inflows, ensured stable financing of the external deficit, while the Czech economy experienced high inflows of short-term capital during the pre-crisis period. Because both countries held high interest rate differentials relative to the main international currencies, one should examine the other explanation of the different types of capital flows.

The Polish authorities decided to postpone the liberalization of the capital account and impose restrictions on non-bank short-term capital flows, while the Czech authorities liberalized capital account transactions in 1995 and never applied capital controls except during a very short time period around the exchange rate crisis. The Czech economy became more open to financial flows, which stimulated further development of the Czech financial markets. On the other hand, the size of the Polish domestic market attracted non-debt creating capital flows, which exceeded the level of those streaming into the Czech Republic. At the time of the financial crisis in Asia, the Czech Republic, in

comparison with Poland, experienced less favorable economic conditions. Increasing imbalances in the economy like excess domestic demand, external imbalance in spite of a large capital inflow, real appreciation of the Czech koruna, and deepening public finance deficit together with the unstable domestic political situation convinced investors that the macroeconomic trends in the Czech Republic were unsustainable. Conversely, the Polish economy preserved investor confidence because economic growth appeared to be strong and the current account deficit of 3.2 percent of GDP was viewed as sustainable[1].

During the period of targeting the monetary aggregate M2 within the framework of the crawling band system, the NBP missed money supply targets most of the time yet inflation consistently fell. In light of this, in February 1998, the NBP widened the exchange rate band to ±10.0 percent and the rate of crawl was reduced to 0.8 percent per month in aiming to reduce the conflict between two intermediate targets of Polish monetary policy. The higher flexibility of the zloty would also help discourage short-term capital flows and stimulate disinflation. The experiences of the NBP with the crawling band regime of the zloty showed that this exchange rate arrangement kept inflationary expectations at a relatively high level and the rate of crawl could go from imposing a ceiling on inflation to a floor. As in the Czech Republic, the fixed exchange rate arrangement proved to be an ineffective instrument in lowering inflation to one-digit rates. Moreover, the persistence of wage and salary indexation slowed the momentum of disinflation.

The increasing integration of Polish financial markets with global markets along dynamic development in Polish financial markets relaxed the link between inflation and two intermediary targets, money supply growth and the exchange rate of the zloty. Moreover, the intermediary targets gradually lost congruity with the underlying conditions of an advanced stage of financial openness of the Polish economy. Under these conditions, monetary policy cannot fully react to internal shocks, because the domestic economy is both hampered by unstable capital inflows and subject to disturbances transmitted from the anchor country. Finally, the problem of considerable excess liquidity in the Polish banking sector distorted the process of transmitting central bank signals to the economy. Under these circumstances, the strategy of inflation targeting offers an attractive alternative to other monetary policy regimes because, among other reasons, it abandons intermediate targets.

Table 1 Adjustment of Monetary Policy Strategies in Poland

	Instruments	***Intermediate Target***	***Final Target***
1990	Direct instruments	M2 growth	Fixed exchange rate
1991			Crawling peg regime with the monthly rate of crawl 1.8%

[1] The estimations suggest that a sustainable current account deficit in the case of Poland is a maximum of 4.7 percent of GDP and 2.1 percent of GDP in the case of the Czech Republic. (Edwards, 2000).

1993	Reference rate		which was gradually reduced.
1995	Reserve money		Crawling band regime with the fluctuating band ±7.0%
1997			Crawling band regime with a 1.0% monthly rate of crawl and with the fluctuating band ±7.0%
1998	Reference rate		Crawling band regime with a 0.8% monthly rate of crawl reduced to 0.65% in July 1998, and to 0.5% in September 1998, the fluctuating band was widened from ±7.0% to ±10.0% in February 1998, and to ±12.5% in October 1998.
1999	Reference rate	NA	Official CPI & Crawling band regime with a 0.5% monthly rate of crawl reduced to 0.3% in March 1999; the fluctuating band was widened from ±12.5% to ±15.0% in March 1999.

Notes: The "Reference rate" is the rate of interest on short-term open market operations.
Sources: IMF, NBP.

3. Inflation Targeting in Poland

In September 1998, the Monetary Policy Council (MPC) of the NBP announced its decision to change its monetary policy by adopting an inflation targeting regime. As in the Czech Republic, this change in strategy was motivated by the goal of entry into the European Union.

Following the statement of the Council (MPC, 1998), the choice of this monetary policy strategy was supported by relatively strong arguments for the adoption of inflation targeting that stem from the shortcomings of other monetary policy strategies. Under the inflation targeting regime, a monetary policy goal is explicit and comprehensible to economic agents. This system limits the discretionary behavior of a central bank and allows for public verification of monetary policy directions and effectiveness, thereby enhancing the policy's credibility. Hand in hand with central bank credibility, this strategy allows for minimizing the social costs of a disinflation process. In addition, a greater flexibility in applying monetary policy instruments reduces the shortcomings of a fixed exchange rate and enables the central bank to sensitively react to the specific nature of an inflationary shock.

While choosing the inflation targeting strategy, the MPC was aware of its limitations under Polish conditions including a limited accessibility of information required for the assessment of inflationary reactions to monetary policy instruments, the absence of co-ordination of fiscal and monetary policies, and the problem of delayed reactions. Notwithstanding these limitations, compared with alternative strategies, the MPC judged the inflation targeting regime to be the best policy approach for the time leading to Poland's expected accession to the EU and the EMU, respectively. The following chapter describes the possible limitations of inflation targeting in more detail.

3.1 Prerequisites for Inflation Targeting

In the literature, several preconditions for successful inflation targeting have been identified (see, for example, Bernanke, 1999 or Debelle, 1998). In the following paragraphs, I will consider the generally

recognised elements such as reasonably low inflation, public support for price stability, the clearly defined objective of achieving price stability together with the absence of other nominal objectives, a sufficiently independent central bank, the absence of fiscal dominance, well-developed financial and money markets, and the capacity of the central bank to model and forecast inflation.

Reasonably low inflation in comparison with other inflation targeting countries

The level of inflation in transition countries such as Poland and the Czech Republic should be judged by the process of price adjustment. Therefore, the direct comparison of the inflation levels in transition countries with those prevailing in advanced inflation targeting countries is inappropriate. Moreover, the adoption of inflation targeting in transition economies is associated primarily with a policy goal to disinflate instead of stabilising low inflation. Following this argument, the level of inflation in Poland should be compared with that in other advanced transition economies that also adopted inflation targeting like the Czech Republic, Chile and Israel. The Polish inflation rate proves to be close to that in the latter countries at the time when they adopted inflation targeting.

Public support for price stability

The priority of price and monetary stability has to be observed by policy-makers, the country's main market participants, and society as a whole. As a result, advanced public information policy plays a very important role. Moreover, the NBP requires strengthened confidence in the central bank commitment to achieve the declared target. To raise central bank credibility, the Council decided to provide a detailed explanation of specific policy decisions and their impacts on target fulfilment in the so-called "Inflation Reports". This report is the main analytical document that is published semi-annually, and in the future will be released on a quarterly basis. In aiming to strengthen monetary policy transparency, the information about the voting by each Council member will be periodically published.

Clearly defined objective of achieving price stability and absence of other nominal objectives

The credibility and transparency of inflation targeting depends upon the clearly defined objective of achieving price stability and the absence of other nominal objectives like a pegged exchange rate. In the first stage of adopting inflation targeting by the NBP in Poland, the crawling band of the zloty was not abolished but the tolerance band was widened from ±12.5% to ±15.0% on March 24, 1999. The Polish authorities suggested that the band was wide enough to minimize possible conflicts with the inflation target. Following the theory of inflation targeting and the general agreement that the role of the band in capping appreciation pressures was probably small, the NBP joined the "pure" inflation targeting regime with a floating exchange rate regime in April 2000. It is expected that the new exchange rate arrangement will help bring the market rate of the zloty to the equilibrium rate. On the

other hand, the NBP will maintain the right to intervene in foreign exchange markets when it recognises a need to do so for monetary policy reasons.

Sufficiently independent central bank

This prerequisite primarily relates to the instrumental independence of a central bank, which in reality means the ability of a central bank to conduct monetary policy independently of political pressures. In the beginning of 1998, under the new Constitution and the National Bank of Poland Act, the independence of the NBP was strengthened, most notably by giving primacy to price stability as a goal of policy and by the prohibition of direct financing to the government by the central bank. Moreover, the decision power in the field of monetary policy was delegated to the newly instituted Monetary Policy Council (MPC). The Council consists of the President of the NBP and nine other members appointed in equal numbers by the President of the Republic of Poland, the Sejm and the Senate of the Parliament. In the future, problems with the complete reconstitution of the MPC might arise. In 2004, when the terms of all current members will expire, the appointment of new members may face political pressures. Therefore, the provision for reappointment and overlapping membership should be incorporated into the law about the MPC.

Absence of fiscal dominance

Following monetary policy theory, a monetary authority exercises limited control over inflation development under the condition of fiscal dominance. A contractionary monetary policy measure aimed at lowering inflation pressure caused by government debt will initially lower seigniorage revenue and require that the additional debt be issued; which ultimately will lead to higher inflation. Fortunately, the problem of fiscal dominance in Poland was greatly diminished in the last few years. The general government deficit in 1992 reached the level of 7 per cent of GDP and during the second half of the 90s fell to 3 per cent of GDP. Public debt has been reduced from 70 per cent of GDP to around 40 per cent in 1998. However, the government spending ratio, and particularly that on transfers to households, is high in Poland relative to other advanced transition economies and contributes to continuing budget deficits. Similarly, the seigniorage revenues, though slightly falling to 2 per cent of GDP on average, remain on a higher level than is prevailing in most advanced economies including the Czech Republic (see Jonas (2000) or Schobert (2001)).

Developed financial markets

Although the privatisation of the Polish bank sector is not yet finished, the Polish banking system seems to be healthier than the Czech system especially with respect to the share of bad loans. The Polish authorities have chosen the strategy of relatively high inflation to devalue the real value of bad loans. On the other hand, the Polish financial sector is apparently less developed (bank assets in the CR amount about 130 percent of GDP in Poland only 50 percent of GDP) and completion of bank

privatisation is necessary to ensure the full effectiveness of the transmission of official to banking interest rates. In contrast with the Czech Republic, Polish enterprises are less dependent on bank loans. The adjustment of the interest rates influences their financial situation and investment intentions by a relatively small amount. On the other hand, the indirect effect of interest rate changes on inflation through the movements of a nominal exchange rate seems to have stronger impact on firms' behaviour.[2]

The other aspects limiting the development of financial markets in Poland are the existing capital controls, which require the prior NBP approval on non-bank short-term capital flows. Unfortunately, Polish authorities decided to delay the abolition of capital controls. Following IMF criticism, the sizeable offshore spot and forward markets for the zloty along with unfettered access for residents to foreign currency deposits and credits from domestic banks mean that the remaining exchange controls did not constitute much of an impediment to speculative pressures on the zloty or to the accumulation of foreign debt (IMF, 2000). Therefore, the abolition of the capital controls could stimulate the development of domestic financial markets, improve monitoring of foreign exchange transactions, and facilitate hedging.

Well-developed money market

The money market in Poland is not yet fully developed. The gradual adjustment of the policy instruments by the NBP includes the introduction of more effective instruments which aid in the pursuit of the direct inflationary target. This, of course, will affect the behaviour and the structure of the money market in Poland.

Capacity of the central bank to model and forecast inflation

The NBP like other central banks in transition countries has to face the difficulties of estimating a reaction of inflation to changes in monetary policy, specifically the interest rate elasticity of domestic supply. But this problem is not regime specific and would persist under different monetary policy regimes. To overcome this limitation facing the implementation of the inflation targeting strategy in Poland, the MPC's decisions rely mainly on a wide range of indicators of potential inflationary pressures rather than on a specific inflation model.

This controversial issue will be the focus of the following section.

[2] This assumption is coherent with the results of the bivariate Granger causality test. The interest rates are not Granger-causal to industry production at the 5 per cent probability as opposed to the nominal exchange rate of the zloty, which proves to be Granger-causal to industry production.

3.2 Technical Issue of Inflation Targeting in Poland

The ability of a central bank to target inflation through forecasting a future inflation path depends on the statistical attributes of inflation. Therefore, this section examines the basic statistical characteristics of inflation history in Poland in comparison with the inflation path in the Czech Republic. Considering the short time period in which inflation targeting was implemented in both countries, the following results should be perceived as preliminary.

As Figure 1 shows, during the 90s, Polish inflation was characterised by a downward path that proved to be very steep since 1992. (The inflation rates for the year 1990, which ranged from 200 to 1200 per cent, are not depicted in the figure.) The faster than expected disinflation in 1998 was replaced by strengthened inflationary pressures the following year. This upward path can be interpreted as a correction of the relatively strong disinflation pressures of the previous year. The prior disinflation speed seems to be unsustainable in the long term primarily in light of relative price adjustment related to the price convergence to the European Union level. Therefore, one should consider the possibility of a structural break in the inflation time series.

Figure 1 Annual CPI Inflation

Source: Bloomberg (2002).

The first step of statistical analysis is comprised of the augmented Dickey-Fuller Unit Root test. Polish inflation proves stationary for six to ten lagged difference terms. In the case of the Czech inflation indicators, these results are less favourable[3]. Applying a Jarque-Bera test, one has to reject the null hypothesis of normality for the whole sample period. In spite of this, the normality of CPI inflation cannot be rejected for the period of a fixed exchange rate for the zloty as well as during period of inflation targeting thereby holds some promise for inflation forecasting in Poland. The distribution of the inflation time series in both countries is asymmetric: in the case of the Polish CPI and the Czech CPI the series displays a long right tail while the case of Czech net inflation displays a long left tail.

[3] The Czech CPI inflation is non-stationary while the base index of net inflation is stationary for four, six, seven and eight lagged difference terms.

Moreover, the distribution of the Polish inflation time series proves to be strongly peaked relative to the normal distribution. On the other hand, the Czech net inflation time series is characterised by a flat distribution relative to the normal.

The analysis of inflation variability indicates that the adoption of inflation targeting in Poland was accompanied by reduction in the inflation level and the most importantly, in fluctuation of the CPI. According to the theory of inflation targeting[4], a direct inflation targeting regime should in fact contribute to a more stable inflation trend. As Table 2 shows, the standard deviation of the inflation series during the pre-inflation targeting period in Poland was higher than in the period following this monetary policy regime. Contrary to the case of Poland, the variability of Czech net inflation after the adoption of inflation targeting increased. However, these results are not very robust due to a limited number of observations. Nevertheless, based on this preliminary analysis, the Polish inflation targeting regime has been more successful in reducing the volatility of inflation while the Czech regime, on the other hand, encountered more success in lowering overall inflation. Nevertheless, the generally high degree of inflation variability during previous years in Poland signifies that Poland's inflation tolerance bands might prove to be inadequately narrow.

Table 2 Descriptive Statistics of Inflation Indicators

y-o-y changes	**Polish CPI**				**Czech CPI**	**Czech NI**		
Sample period	***90/I - 00/IV***	*90/I - 91/IV*	*91/V - 98/XII*	*99/I - 00/IV*	***93/I - 00/VIII***	***95/I - 00/XII***	*95/I - 97/XII*	*98/I - 00/XII*
Mean	**105.048**	627.098	31.130	9.632	**9.257**	**5.175**	7.588	2.761
Median	**31.475**	610.320	31.475	9.845	**8.925**	**6.100**	7.251	2.350
Maximum	**1173.270**	1173.270	82.200	14.100	**21.900**	**11.293**	11.293	7.900
Minimum	**5.640**	83.610	8.490	5.640	**1.100**	**-0.600**	4.600	-0.600
Std. Dev.	**256.558**	451.370	16.955	2.621	**5.387**	**3.340**	1.816	2.711
Skewness	**3.371**	-0.023	1.043	0.149	**0.9029**	**-0.176**	0.703	0.609
Kurtosis	**12.951**	1.237	3.857	1.957	**3.510**	**2.071**	2.709	2.293
Jarque-Bera	**746.529**	2.075	19.500	1.371	**14.082**	**2.960**	3.100	2.973
Probability	**0.000**	0.354	0.000	0.504	**0.000**	**0.228**	0.213	0.226

Note: The net inflation data are available since January 1995. In the sub-period analysis of the exchange rate I omit May 1997 due to very high volatility of the CZK in the course of the exchange rate crisis.
Source: Author's calculations based on IMF, OECD data.

[4] On the other hand, the fiscal theory of price level assumes that the central bank can determine the average rate of inflation. The variance of inflation cannot be perfectly controlled because the central bank is not able to eliminate the impact of shocks on the price level caused by fiscal policy (Christiano, 2000).

A sophisticated investigation into inflation variations includes the recursive residuals test for Polish CPI and the Czech NI. The modification of the Dickey-Fuller procedure and the application of the t-test on the specification of the lag length give us the following equation:

$$\Delta\pi_t = a + b\pi_{t-1} + c\ \pi_{t-2} + \omega_t, \quad (1)$$

where π is the inflation indicator and ω the error term.

The recursive residuals of the OLS estimation, in general, suggest instability in the estimated parameters as indicated in the distribution of structural shocks when the residuals exceed the standard error band. The outcomes from the recursive residual test for Polish CPI inflation and Czech NI are shown in Figure 2 and 3. In both cases, the greater financial instability in the first half of 1997 on the Central European financial markets due to the Asian financial crisis led to the upward pressures on inflation expectations. In the Czech Republic, these inflationary pressures were intensified by the exchange rate crisis of the CZK. The subsequent macroeconomic policies supported faster disinflation in the Czech economy relative to that in Poland. The infraction of the band in 1998 in the Czech Republic suggests that the Czech direct inflation targeting regime gained more credibility relative to the Poland case, when this break did not appear in the time of the adoption of the inflation targeting regime. In general, the Figures 2 and 3 suggest that the implementation of inflation targeting was accompanied in both cases by a decreased volatility of recursive residuals leading to the possibility of a higher predictability of inflation.

Figure 2 Recursive Residuals of Poland's CPI

Figure 3 Recursive Residuals of the Czech NI

Notes: The seasonally adjusted monthly data on the CPI and NI are transformed in logs.
Source: IMF (2001), CNB (2001).

Further investigation of the inflation series verifies the significance of a time series trend, and autoregressive (AR) process described in the following equation:

$$\Delta\pi_t = a + b\ t + c\ AR(p) + \mu_t, \quad (2)$$

where $\Delta\pi_t$ is the first difference of inflation indicator in time t, t is time trend and μ_t the error term.

As Table 3 shows, Polish CPI inflation is characterised by a statistically significant negative time trend which suggests that the Polish economy has been successfully set on a disinflation path. In the case of the Czech Republic, the negative time trend of net inflation proves to be statistically insignificant due to the temporary upward movement of NI since the half of 1999. Otherwise, the statistical significance of the autoregressive trends indicates some persistence of inflation in both countries. In Poland, some degree of inflation inertia is due to persistent nominal wage indexation while in the Czech Republic, this inertia is due to a gradual lowering of inflation expectations.

Table 3 Estimation of AR Process of Inflation Paths

First differences of	Constant Term	Time Trend	AR(1)	AR(12)	R^2
Polish CPI Inflation (93/I - 00/III)	***0.0361*** (12.6330)	***-0.0003*** (-8.3990)	***0.3321*** (3.0687)	-0.0963 (-1.1414)	64.1676
Czech NI Inflation (95/I - 00/XII)	NA	-0.00002 (-1.3106)	***0.4776*** (4.5221)	***-0.4550*** (-4.3387)	56.4480

Notes: The CPI inflation in Poland and the NI inflation in the CR are observed as monthly data and after seasonal adjustment by Census X11(m) transformed by taking logarithms. Due to the limited stationarity of these inflation time series for only some lagged difference terms (see Table 2), the estimation is run in the first differences of inflation indicators. In the case of Polish CPI, the sample period was chosen to prevent the effects of hyperinflation of the early 1990s and in the case of the Czech NI, the sample period is limited by data availability. The estimation of equation 2 suggests the statistical significance of the first and twelfth autoregressive error terms. Though in the case of Poland the twelfth autoregressive error terms are not statistically significant, they enhance the statistical quality of the model. Furthermore, the estimation of the AR process of the Czech NI does not prove the statistical significance of the constant term; instead, its inclusion worsens the statistical property of the model. Therefore, the constant term is not included in the model. On the other hand, one dummy variable is introduced to capture the effect of the exchange rate crisis of the Czech koruna in May 1997. The stability tests reject the serial correlation, hetereoscedasticity and non-normality of both inflation time series. The t-statistics are in parentheses. The statistical significant values are presented in bold italics.
Sources: Author's calculations based on IMF and CNB data.

The estimation of AR process of inflation allows for the investigation of inflation path's structural consistency. Using the Chow's Breakpoint and Chow's Forecast Test, I examine whether the adoption of inflation targeting has contributed to a significant structural change. Unfortunately, the preliminary results recorded in Table 4 are very ambiguous. In aiming to clarify this issue, I compute other suitable tests, such as the autocorrelation and the unit root tests. The unit root test was run separately for the pre-inflation targeting period and for period of inflation targeting in both countries[5]. The preliminary results, based on the Poland's on short-term experience with inflation targeting, indicate a negative break in the CPI time series. In the time period from 1993 to 1998, the CPI path proves stationary, and therefore predictable, for seven, eight and nine lagged difference terms at the five percent significance

[5] Detailed results of unit root tests are available from author.

level. From 1999 the stationarity of Polish inflation was observed only in the case of five lagged difference terms. Czech NI from the pre-inflation targeting period was determined to be non-stationary. At the time of the inflation targeting regime's implemention, the net inflation path seems to be stationary for seven lagged difference terms just at the ten percent significance value. The results of the estimation of inflation autocorrelation suggest negative consequences of implementing inflation targeting on the inflation time series. If the coefficients of lagged inflation decline during the time of the inflation targeting regime, one would expect the lowering of inflation inertia according to one of the proclaimed advantages of the inflation targeting regime. Unfortunately, the rise in the coefficient values in both countries unequivocally rejects the previous presumption. (The higher values of the autocorrelation coefficients for Czech net inflation suggest some persistence of inflation expectations. Nevertheless, the inflation expectations have already reached a relatively low level (see CNB, 2000).)

Table 4 Estimation of AR Process of Inflation Path

First differences of	Breakpoints	Test	F-statistic	Log likelihood ratio
Polish CPI Inflation (93/I - 00/III)	***99/I***	Chow Breakpoint	***3.049 (0.023)***	***12.548 (0.014)***
		Chow Forecast	1.352 (0.205)	4.664 (0.079)
Czech NI Inflation (95/I - 00/XII)	***98/I***	Chow Breakpoint	NA	NA
		Chow Forecast	0.486 (0.933)	***55.653*** (0.019)

Note: The probability of the F-statistic or the log likelihood ratio statistic is in brackets. The statistical significant values are presented in bold italics.
The results of the Chow Breakpoint Test for the Czech NI inflation are not defined due to an insufficient number of observations in the sub period.
Source: Author's calculations based on IMF and CNB data.

Table 5 Inflation Autocorrelation

Inflation	Period	Inflation Autocorrelations by periods lagged					
		1	2	3	4	5	6
Polish CPI Inflation	***93/I - 98/XII***	***0.729***	***0.505***	***0.249***	***-0.005***	***-0.236***	***-0.490***
		(0.004)	(0.002)	(0.004)	(0.009)	(0.011)	(0.001)
	99/I - 00/IV	***0.829***	***0.604***	***0.359***	***0.134***	***0.032***	***-0.044***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.0000	(0.001)
Czech NI Inflation	***95/I - 97/XII***	***0.928***	***0.822***	***0.680***	***0.530***	***0.377***	***0.241***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	98/I - 00/XII	***0.937***	***0.840***	***0.718***	***0.581***	***0.428***	***0.280***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: The probability of the Q-statistic is in brackets. The statistical significant values are presented in bold italics.

Source: Author's calculations based on IMF and CNB data.

The "inflation model" based on the estimation of equation 2 allows also for the comparison of the modelled inflation path with an actual inflation development and an inflation target as well. For this purpose, I forecast the path of Polish CPI from equation 2 for the year 1999 under the presumption that the stance of monetary policy of the NBP remained unchanged during this year. The results suggest that under these unchanged circumstances the NBP would undershoot the 1999's inflation target. (The sources of the inflation target's overshooting are analyzed in the section 4.)

Figure 4 Inflation Forecast from Polish CPI Model

Notes: In December 1999, the value of the modelled CPI inflation expressed in the first difference of the log was equal to 0.00416 and the convert inflation band was 0.00431-0.00437. The actual CPI inflation reaches the value of 0.00439.
Source: Author's calculations based on IMF and CNB data.

3.3 The Policy Instruments and their Effects on Inflation

In Poland, determining the links between monetary policy instruments and the inflation outcomes is complicated partly by the high degree of structural changes, especially in the early 1990s, and partly by major revisions in the monetary policy regime. These revisions were more frequent than is obvious in another advanced transition countries, for example, as in the Czech Republic. In general, the statistically unfavourable behaviour of inflation and interest rates in the course of transition process, when both variables have been falling nearly monotonically, hampers any statistical test to identify the basic macroeconomic relationships in the economy.

The central bank using inflation targeting relies upon an econometric model of inflation; however, there is no formal requirement for this. Major central banks depend in part on leading inflation indicators. Accordingly, I try to identify the basic linkages between inflation and various so-called leading indicators of inflation. Among the potential leading indicators, I rate the real economic activity variables (industry production and retail sales), money market variables (3-month Treasury bill rate and broad money), inflation indicators (CPI, PPI, share price index, import price index, German's CPI

and PPI), labour market variables (unemployment and wages) and external balance indicators (nominal and real effective exchange rate).[6] To estimate, at least roughly, the statistical relationships between inflation and leading indicators of inflation, one can apply the bivariate Granger causality test[7]. This test indicates a reasonable linkage between the exchange rate and inflation measures (CPI, PPI and import price index). Moreover, the Granger causality test demonstrates linkage between foreign price development (in our case in Germany) and Polish inflation, interest rates and industry production in accordance with the theory of an open economy. Nevertheless, the lack of a statistical linkage between changes in short-term interest rates and changes in inflation is a serious shortcoming in the successful implementation of the inflation targeting regime in Poland. This preliminary finding could also suggest that the transmission of interest rate adjustment to the Polish economy is not direct but goes through the circuitous transmission channel which complicates the necessary identification of the monetary policy transmission mechanisms in Poland. Under these circumstances, the exchange rate of the zloty appears to remain an important monetary policy instrument. The Granger causality test confirms also the linkage between inflation (both domestic and foreign) and wages in the Polish economy. Finally, the analysis supports the hypothesis that domestic production is marginally influenced by interest rate adjustments but quite sensitive to the external inflation factors. Based on the above results, one can make some preliminary conclusions about the monetary transmission mechanism in Poland. The Granger causality test pointed to the existence at least two monetary policy channels. The "foreign channel" starts with a nominal exchange rate which via import prices influences both the CPI and the PPI inflation. The "domestic" channel begins with the nominal exchange rate as well but affects the CPI inflation via wage adjustment. Moreover, the analysis suggests a reverse effect of the CPI on wage development thereby conforming the hypothesis of persistent wage indexation in the Polish economy.

An important shortcoming of bivariate Granger causality testing is that it provides no information about the sign of the bivariate relationship. Because of this, I run the VAR together with the estimation of impulse response functions to assess the short-run as well as the long-run dynamic relationship between inflation and economic indicators. The policy variables, such as the interest rate and nominal effective exchange rate, were finally put in the ordering of variables in the VAR.[8] The CPI index, wages, industry production, and the dummy variable capturing large outliers in the price index from

[6] All variables are observed as monthly data. The data sources include IMF and OECD statistics. Excluding the 3-month Treasury bill rate, all variables are seasonally adjusted by Census X11(m) and transformed by taking logarithms. In accordance with the results of the unit root test, all variables are applied in first differences.

[7] Detailed results of the Granger causality test are available from author.

[8] Ordering the policy variables in the final position in the VAR does not change the basic shape of estimations. Detailed results of the VAR are available from author.

October 1993 to January 1994 are placed in front of the policy variables.[9] According to the Schwarz criterion and the relative short time series of variables, a lag order of one seems to be appropriate. Because the cointegration test showed that two cointegration relationships among the levels of variables do exist, the subsequent estimations were run in levels.[10] The sample period covers nearly eight years, from January 1993 and April 2000.

The impulse response analysis for the Treasury bill rate confirms its statistical insignificance not only for inflation development but also for other variables of this model. The 90 percent confidence bands in most of these cases range in both the positive and negative sectors of the graphs. Therefore, specifying the sign of the relationship among these variables is very restricted, yet the course of the variable responses seems to be economic meaningful. The exchange rate shocks have an anti-inflationary effect on domestic inflation. Moreover, an appreciation of the zloty leads to a reduction in interest rates. Therefore, the exchange rate proves once again to be an appropriate anti-inflationary policy instrument of the NBP. (Industry production is to a statistically insignificant extent negatively affected by an appreciation of the zloty.) The impulse response analysis shows that the impact of a price shock tends to persist in the medium term. The CPI inflation shock increases wages and leads to a depreciation of the zloty. On the other hand, the inflation effects on the interest rate and industry production are ambiguous.

Based on the straightforward extension of the preceding impulse response analysis, I proceed to he estimation of the VAR for CPI inflation and the selected "inflation indicators"[11]. The rising interest rate has a statistically significant reverse effect on CPI inflation. Unfortunately, the other inflation indicators such as wages, industry production and the nominal exchange rate prove to be statistically insignificant. In light of these results, further investigation of possible inflation indicators for Polish CPI inflation are necessary.

3.4 Specific Features of Inflation Targeting in Poland

The country-specific features of the inflation targeting strategy in Poland result from the specific economic conditions described above which come from the incomplete transformation process.

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[9] The other variables do not appear statistically significant and their inclusion into the model does not improve the results. Therefore, considering the relative short time series limiting the degrees of freedom, I omit the wage variable from the VARs analysis. Following this argument, the foreign price indicators were excluded as well. Moreover, one can expect that the foreign price effect is, at least partly, incorporated into the exchange rate effect on domestic inflation.

[10] Detailed results of the cointegration test, as well as of the impulse response analysis are available from author.

[11] Detailed results of the VAR are available from author.

Despite the fact that many inflation targeting countries apply the so-called "core inflation" index, the MPC has chosen to target the Consumer Price Index with the belief that it is a more accurate measure of structural changes in the economy's price level. Its decision is also based on the presumed widespread public recognition of the CPI. From a pragmatic point of view, the MPC's choice was restricted by the lack of a "core inflation" time series for domestic economy.

In view of the aim to join the EU, the Polish inflation targeting framework helps to design the optimal trajectory of disinflation by choosing a long-term inflation goal. It implies the unambiguous declaration of the disinflation path and explicit quantitative targets for disinflation. Accordingly, the NBP set two inflation targets: the first, a short term target with the time span of one year and the second, a long term target, for the year 2003 in order to anchor inflation expectations (see Table 6). The Council is ready to extend the time horizon of the monetary policy target if the monetary policy impact time lags get longer with lower inflation and the development of financial markets.

The tolerance band was intentionally defined narrowly in order to be regarded as credible, although the NBP expressed its intention by gradually widening the target interval in the future. Already in 2000, the NBP had widened the inflation target range for 2001 from 1.4 percentage to 2 percentage points to better reflect the volatility in inflation and the virtual absence of satisfactory models of inflation in Poland.

Because the external environment affects Polish price development to a significant extent, the Polish authorities are resolved to provide detailed explanations when the monetary policy reactions apparently conflict with the direction of the discrepancy between the inflation target and the observed level of inflation. This problem can arise when the impact of external factors affecting solely CPI but not "core inflation".

In addition to the CPI inflation target, the NBP maintained the crawling band regime of the zloty. This so-called flexible inflation targeting regime was abounded on April 12, 2000 reflecting an effort to strengthen the operations of the monetary policy framework based on inflation target. The Polish currency was moved toward an independent floating, while the Polish's monetary policy strategy moved to the strict inflation targeting regime. The revocation of the crawling band regime proceeded very smoothly with only a relatively brief period of higher exchange rate volatility.

Some general risk to the inflation targeting strategy in Poland comes out from the widespread indexation (wage and salary indexation) and high degree of inertial inflation still prevalent in the Polish economy.

Table 6 Inflation Targets in Poland

Official CPI *(December of previous year = 100)*	***Target range***	***Exchange Rate Regime***	***Actual inflation***
1999	8.0 – 8.5% (additionally changed to the range of 6.6 - 7.8%)	Official CPI & Crawling peg regime with a 0.5% monthly rate of crawl reduced to 0.3% in March 1999; the fluctuating band was widened from ±12.5% to ±15.0% in March 1999.	9.8%
2000	5.4 – 6.8%	Managed floating regime since April 12, 2000	8.5%
2001	6.0-8.0%		3.6%
2003	below 4.0%		

Source: The Monetary Policy Council, 2001.

4. Practical Experiences with Inflation Targeting in Poland

During 1998, a sizeable nominal appreciation of the zloty together with the other factors such as excess agricultural stocks and negative demand shocks from falling Russian demand helped to disinflate the Polish economy. In early 1999, however, the zloty depreciated in response to the monetary easing, but it did not reverse the increase in the price of nontradeables relative to tradeables. The upward trend in prices of nontradeables versus tradeables has persisted, which was also evident in the Czech Republic, probably reflects Balassa-Samuelson effects and administered price increases which disproportionately affect non-traded goods. Much higher inflation in service prices in Poland compared to the Czech Republic can imply that the presence of the Balassa-Samuelson effects in the Polish economy is more evident. Under these conditions, the lowering of Polish inflation would be more onerous relatively to the Czech one.

In 1998, the favourable inflation developments together with the schedule of the Polish government to reduce fiscal deficits at the end of 1999 to 2.6 percent of GDP persuaded the NBP to lower interest rates (see Figure 6). The higher than targeted government budget deficit in both 1999 and 2000 did not help to cut down the current account deficit and lower inflation. Instead, the current account deficit reached roughly the eight percent level in relation to GDP at the end of 1999. Moreover, some strengthened inflationary pressures, such as rising oil prices, increasing officially controlled prices, and rising food import tariffs together with rapid increase in household credit, led to inflation target overshooting (see Figure 7)[12]. In this view, an increase in official interest rates in late 1999 had been necessary. The central intervention rate was raised in four steps between September 1999 and August

[12] In accordance with the "inflation model" constructed in the section 3.2, the 1999's inflation target would be undershot under unchanged conditions.

2000 to reflect the reality of the overshooting of the 1999 and 2000 inflation targets. The monetary policy tightening accompanied by the strengthening of the zloty, moderate real wage growth along with the so-called "inflation surprise", the deceleration of money and credit aggregates, the weakening of domestic demand, and falling international price oil prises together with a sharp decline of tradable relative to non-tradable prices arising from differential productivity growth helped to reverse an upward trend in the inflation path.

The monetary policy target for the year 2001 was adopted at a higher level than that in the previous year, since the MPC does not expect the negative supply shocks which hit Polish inflation in mid-1999 to recede. The uncertainly concerning the scope and force of the supply shocks' impact on inflation together with questionable stance of the public sector finances lies behind the setting of the inflation target within broader bandwidth than had previously existed.

The accelerating inflation during 1999 was also reflected by the upward shift of yield curves in the financial markets. Since the curves remained inverted, financial agents still expected inflation to decline over the medium term, but from a higher starting point. In view of this shift, the MPC's ability to sufficiently eliminate renewed inflationary expectations appeared to be limited. Conversely, the Czech National Bank was very successful in reducing the inflation expectations of economic agents (Horska, 2000).

Figure 5 CPI and Interest Rate in Poland **Figure 6** Actual vs. Inflation Target in Poland

Source: Author's calculation based on IMF, OECD and CNB data.

5. Conclusion

In 1998, the Monetary Policy Council decided to adopt a direct inflation targeting regime. The Council together with the National Bank of Poland views this new monetary policy regime as part of a disinflation strategy, which should stimulate monetary convergence to the European Monetary Union. The implementation of direct inflation targeting in Poland has several common features that can be observed in all inflation targeting countries. However, there are some unique features of the Polish approach to inflation targeting. The adoption of an inflation target in the form of the Consumer Price

Index characterises the first unique feature of Polish strategy. Unfortunately, the current experiences of the NBP show that closer co-ordination of fiscal and monetary policies play a critical role for successfully targeting the CPI, at least in the field of price deregulation and tax changes.

The second important feature of the Polish approach to inflation targeting is a sequence of targets that defines the disinflation path. To settle inflation expectations of Polish economic agents on the disinflation path, the NBP implemented a gradual specification of inflation targets based on a short term target with the time span of one year and the second, long term target, for the year 2003.

Third, the NBP did not follow the practice of other inflation targeting economies, such as the Czech National Bank, by deciding not to adopt a set of ax-ante caveats that would justify deviations from the medium-term inflation target. Instead, the NBP resolved to provide detailed explanations for instances when the monetary policy reactions apparently conflict with the direction of the discrepancy between the inflation target and the observed level of inflation.

The analysis of the CPI time series in Poland suggests that the degree of inertial inflation in the Polish economy will be an important monetary policy constraint in the coming years. After experiencing an extended period of high inflation, economic agents formulate their inflationary expectations primarily on the basis of past experiences. In addition, the prevailing widespread indexation of wages and salaries and the high degree of inertial inflation in the Polish economy generate a risk to the inflation targeting strategy of the NBP. Therefore, the strengthening of monetary policy credibility will play a significant role in effectively breaking inflationary expectations. Unfortunately, the limited data in the inflation time series, the missing survey of inflation expectations and the lack of various inflation indicators like “core inflation” indicate persisting problems in the implementation of inflation targeting strategy.

In any event, some adjustment of the inflation framework will be appropriate including the strengthening of an inflation forecasting framework, a further widening of the inflation target band so as to be more flexible in reacting to economic shocks, and the specification of a rolling three-year ahead band. Nevertheless, the Polish authorities have to keep in mind that overly frequent modifications of the inflation targeting strategy jeopardises its credibility.

The preliminary experiences of the National Bank of Poland with the strategy of inflation targeting show that this monetary policy strategy applied in a transition country faces some limitations and obstacles; however inflation targeting, in general, offers at least two very important advantages for advanced transition countries: increased control over expectations and short-term flexibility. Therefore, I can, under the conditions expressed as prerequisites for inflation targeting, preliminarily

confirm the appropriateness of direct inflation targeting as a disinflation strategy for the transition economies that aim to converge their domestic inflation to European Union inflation levels. Despite the short-term experiences of the Czech Republic and Poland with the direct inflation targeting, I venture to identify the two most important prerequisites for its successful implementation in advanced transition countries apart from the absence of fiscal dominance. The first prerequisite is well-developed inflation statistics that offer enough information to evaluate various aspects of price development. The second is a well-developed money market that serves as an effective means for transmitting the effects of short-term interest rate adjustments to the economy as a whole.

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Figure 1 Annual CPI Inflation

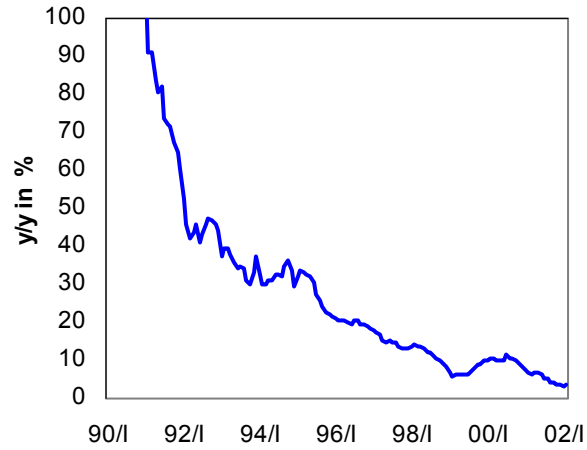

Figure 2 Recursive Residuals of Poland's CPI

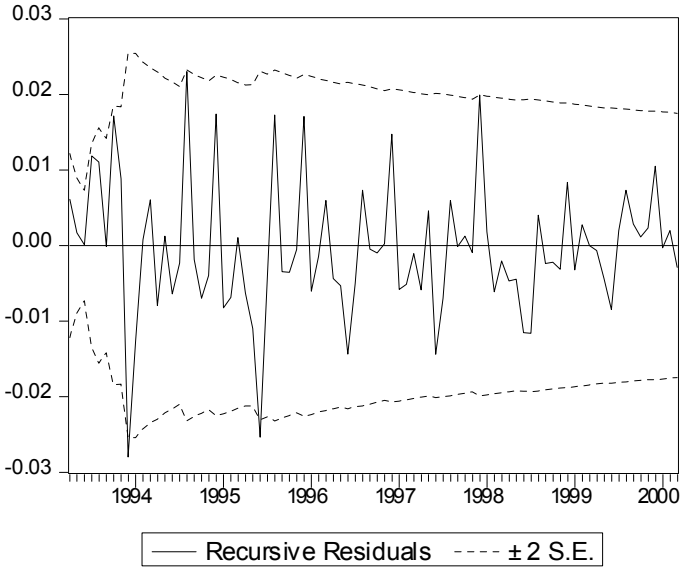

Figure 3 Recursive Residuals of the Czech NI

Figure 4 Inflation Forecast from Polish CPI Model

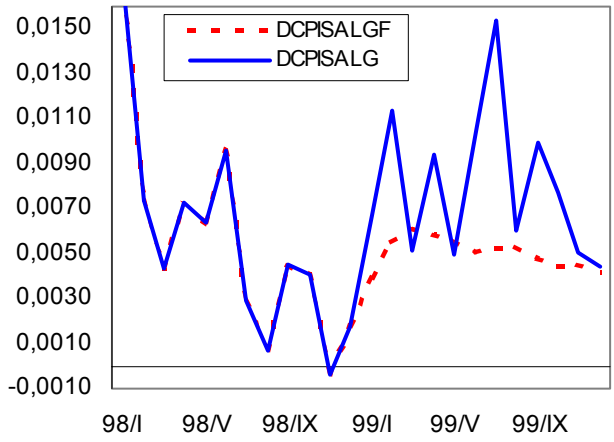

Figure 5 CPI and Interest Rate in Poland

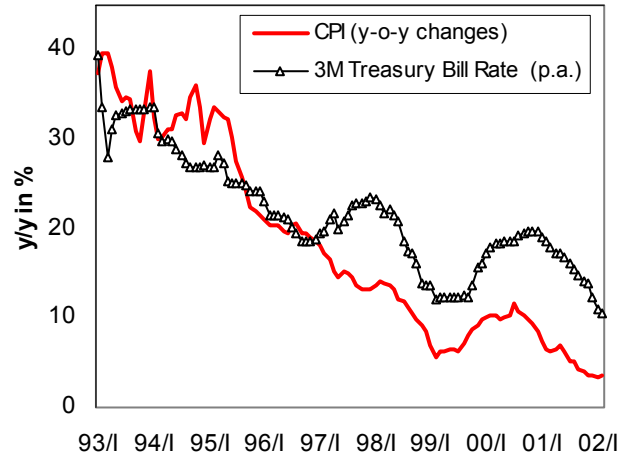

Figure 6 Actual vs. Inflation Target in Poland