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Hits and Misses: Ten Years of Czech Inflation Targeting* *(Introduction)*

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In December 1997, after an episode of sharp exchange rate turbulence, the Czech National Bank (CNB) introduced inflation targeting (IT) as its monetary policy regime, replacing an exchange rate peg installed in the early 1990s. The Czech experience provides a case study in IT that may be interesting for international readers. In particular, the Czech case is unique in two aspects: (i) the CNB was the first transition-economy central bank to introduce IT, and (ii) during the first ten years of the IT regime, inflation remained mostly below the target and never went above the target.

Regarding the first aspect, the pioneering change in strategy was regarded by the outside world as risky and led to a debate on whether or not central banks in transition economies aiming at disinflation could operate IT with the same success as central banks in developed economies aiming at stabilizing inflation.[1] It was unclear whether a transition-economy central bank could build up its own credibility, instead of relying on the imported credibility of an exchange rate peg. The Czech IT experience gradually helped to change the view of international institutions regarding the appropriateness of IT in transition economies, and a growing number of central banks in these economies (Jeffery, and Berlách, 2002) followed the pioneering experience of the CNB (IMF, 2006).

Regarding the second aspect, it is best illustrated with an international comparison. While inflation in the sample of central banks[2] was above the target in half of the cases and below it in the other half, the Czech sample shows predominantly downward deviations vis-à-vis the target (*Table 1*). To this end, it is useful to distinguish the three stages of the Czech inflation-targeting experience. The initial stage (1998–2001) focused on disinflation. During this stage, the CNB used a purely expert-based forecasting system that relied on expert estimates and assessments supplemented with the results of partial-equilibrium models. During this part of the sample, the frequency of target fulfillment was the lowest and the asymmetry of deviations of inflation from the target was the most significant.

During the second stage, the CNB was still focusing on disinflation (2002–2004). The bank started to base its predictions on a new forecasting framework,

* The views expressed in the paper are those of the authors and do not necessarily represent those of the affiliated institutions.

[1] IMF (1998) and Masson et al. (1997) pointed out that transition economies do not meet some of the key conditions for IT.

[2] The selected sample of countries is described in (Antal, Hlaváček, and Holub) in this volume. Similar conclusions have also been arrived at by other studies using different samples of countries; see (Bulíř, Šmídková, Kotlán, and Navrátil, 2007).

TABLE 1 Undershooting of Inflation Targets (in %)

Inflation:	Czech Republic				Sample of countries			
	1998–2007	1998–2001	2002–2004	2005–2007	1998–2007	1998–2001	2002–2004	2005–2007
within the band	34	23	33	50	53	56	57	52
below the band	66	77	67	50	24	25	24	22
above the band	0	0	0	0	23	19	19	26

Note: On-target performance is equivalent to inflation within the target band. The above approach corresponds to the declared target in the first two stages of inflation targeting in the Czech Republic, while only a point target exists in the third stage and a declared tolerance band was used instead. We note that the table employs quarterly data; the distribution would look marginally different if monthly data were used, with several instances of inflation overshooting the target.

the Quarterly Prediction Model (QPM). The framework was initially introduced with the technical assistance of the IMF (Coats, Laxton, and Rose, 2003).

For the final stage (2005–2007), the CNB declared a horizontal target, basing its monetary policy decisions on a fully developed forecasting system with an extended version of the central forecasting model (QPM+). In this stage, the Czech IT performance matched international standards: inflation missed the CNB target in 50 percent of cases and the distribution of inflation deviations appears to have converged into a symmetric distribution. Indeed, in 2008, as inflation has increased substantially world-wide, inflation rates in the Czech Republic have also moved up and, for the first time in the Czech IT history, above the target range (not shown in *Table 1*).

The uniqueness of the Czech experience with inflation targeting was the motivation for putting together this volume. While the first aspect has already been researched and agreement has been reached that inflation targeting is a suitable strategy for transition and developing economies to conduct monetary policy, the second aspect related to inflation target undershooting has not so far been comprehensively covered. The articles in this volume are concerned with identifying the factors that drove inflation below the CNB's inflation targets.

According to the internal CNB debate (Šmídková et al., 2008), there are three potential factors that could explain the observed asymmetric deviations of inflation from the target: (i) a series of counter-inflationary shocks, (ii) a biased forecasting system, and (iii) a faulty decision-making system. Since inflation targeting is associated with "managing" inflation expectations[3], the role of expectations, too, was examined together with the above-mentioned three factors. Consequently, several working hypotheses were formulated and tested in the papers. The names of the hypotheses were as follows: (i) the hypothesis of a "surprised" central bank; (ii) the hypothesis of "skewed sight"; (iii) the hypothesis of an asymmetric target; and (iv) the hypothesis of an "overly credible" target.

The relative importance of these three factors is difficult to identify as no methodology is capable of testing all the hypotheses jointly. Moreover, it is easy to imagine that the individual factors have operated side by side, changing their relative

[3] A credible monetary policy may use communication as a complementary tool to the policy interest rates to directly manage inflation expectations (Eusepi, Stefano, and Preston, 2007).

importance over time. The authors mostly concentrated on selected factors and selected inflation targeting stages while focusing on their chosen methodology.

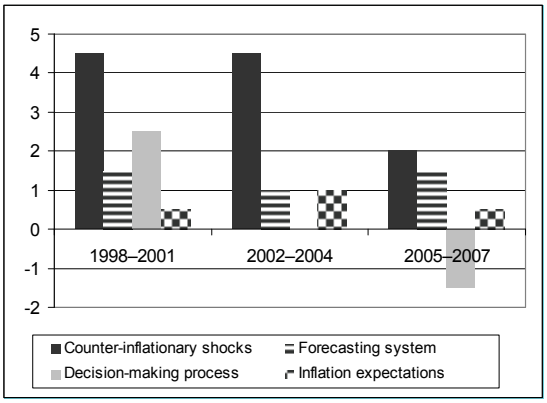
The first two articles, *Inflation Target Fulfillment in the Czech Republic in 1998–2007: Some Stylized Facts* and *Causes of Deviations from the CNB´ Inflation Targets: An Empirical Analysis* provide an introduction to assessing the fulfillment of the CNB inflation targets during the period 1998–2007. By adopting less data-demanding methodologies, as compared to the models applied in the later papers, they are able to cover the entire period under review. The conclusions are relatively independent of the model assumptions, but these papers cannot differentiate all the potential factors in detail. The papers effectively discern between two major sets of factors only – "shocks" and other factors. These papers conclude that inflation targeting was successful with respect to the disinflation process and ensured a low inflation rate for the Czech economy. The identified episodes of target deviations are related mostly to counter-inflationary shocks, both global and specific to the Czech economy. Periods of inflation-target undershooting in the absence of no marked counter-inflationary shocks are identified as well, suggesting a role for either the forecasting system or the decision-making process.

The next two papers, *Do Central Bank Forecast Errors Contribute to Missing of Inflation Targets? The Case of the Czech Republic* and *The History of Inflation Targeting in the Czech Republic Through the Lens of a Dynamic General Equilibrium Model* employ more complex methodologies that enable detailed discussions of separate inflation deviation factors. Increased data demands limited the analyses to the later stages of Czech IT only. In addition, the results are increasingly model- and assumption-dependent. Similarly to the first set of papers, these papers attribute a crucial role to counter-inflationary shocks, irrespective of the chosen methodology. They also point to the forecasting system's role in undershooting, in particular during the first two stages of inflation targeting. The contribution of the decision-making process to the deviations was found to be small relative to the other two factors.

The final two papers, *Asymmetric Monetary Policy in the Czech Republic?* and *Undershooting of the Inflation Target in the Czech Republic: The Role of Inflation Expectations* are both concerned with one specific factor of inflation deviations, namely asymmetries in the decision-making process and the role of inflation expectations. These analyses indicate that the asymmetries may have contributed to the undershooting in the initial targeting stage, when the CNB used two types of target, one to guide its short-term decisions and the other to guide its medium-term, disinflation decisions.[4] In an environment of global deflation shocks during the late 1990s and early 2000s, policymakers may have considered inflation dropping below a higher short-term target as a quicker and cost-efficient way of achieving a lower medium-term target, that is, practicing so-called opportunistic disinflation (Orphanides and Wilcox, 2002). Alternatively, policymakers might have been concerned that a decrease in policy rates – required to compensate for the deflation shocks – would have caused depreciation of the Czech koruna, putting the credibility of the new strategy at risk[5] at a time when the memory of the exchange rate turbulence was still fresh.[6]

[4] One-year and three-year inflation targets were declared in the initial stage of inflation targeting; see (Šmídková and Hrnčíř, 1998).

FIGURE 1 Factors Behind the Inflation Deviations in the Three Stages of Inflation Targeting in the Czech Republic



Note: The figure shows a summary of the "votes" that each factor obtained from the featured articles. Positive values signal that the factor was considered significant by the majority of authors. Negative values, on the other hand, reflect that a majority of the articles dismissed the factor as a source of deviation. For some of the articles, the adopted methodology prevents differentiation of two factors from each other. In that case, both factors receive half a point from that particular vote only.

The empirical results suggest that Czech monetary policy anchored inflation expectations well and that inflation expectations were not the primary factor behind the inflation deviations (Holub and Hurník, 2008). Counter-inflationary shocks, however, were reflected in inflation expectations; hence, expectations might play a secondary role in target undershooting.

Despite the methodological differences, the papers provide a basis for an overview of the most frequently identified factors behind the asymmetric target deviations. In *Figure 1*, we present a "meta-analysis" of the contributed papers, in which we attempt to summarize answers that are (i) model-dependent, (ii) subject to model uncertainty, or even (iii) incapable of defining a complete model capable of describing the entire problem (the partial-analysis approach).

The two key conclusions that follow from this overview are as follows. First, the undershooting of inflation targets in 1998–2007 cannot be explained by a single factor. Second, the individual factors possess different degrees of importance during the different stages of the Czech IT regime. Moreover, each stage involved a combination of these factors.

The most frequently identified source of undershooting are counter-inflationary shocks. The second most frequently identified source, especially during the initial and advanced targeting stages, was the forecasting system. Somewhat surprisingly, the decision-making process is the least frequently identified factor; moreover, its role has evolved significantly over time. While it may have added to target undershooting in the initial stage, it is dismissed as a potential source of deviation in the later stages.

[5] The necessity of maintaining the credibility of monetary policy was on the Bank Board's agenda, for example, in March 1998; see (CNB, 1998).

[6] The International Monetary Fund warned that a strategy based on credibility built using one's own efforts (instead of being "imported" through a peg) might fail in the Czech circumstances; see (IMF, 1998).

The most marked undershooting – by up to 6 percentage points – was observed in the initial stage and was apparently caused by a combination of three factors: (i) global counter-inflationary shocks, (ii) the rigidity of the expert-based system used in forecasting, and (iii) opportunistic disinflation. First, global shocks clearly played a key role: prices of oil and food commodities decreased significantly and the global industrial producer price index declined. Like the CNB, other sample countries undershot inflation (7 out of 10). Domestic shocks deepened the impact of the global shocks and the Czech koruna appreciated sharply and unexpectedly. Second, the key problem identified in the expert-based forecasting system was its rigidity. The system responded slowly to new information and its operators were reluctant to change their priors. The experts argued that either the global price path was only temporary or that the exchange rate pass-through would be weak. Finally, policymakers' opportunistic disinflation took advantage of the counter-inflationary environment. Policymakers were also concerned that an aggressive loosening of the monetary stance could cause credibility losses, paving the way to renewed exchange rate turbulence.[7]

During the second, advanced stage, inflation took its largest departure from the target in 2003. This episode represented the second-largest absolute deviation over the ten-year period and at its peak inflation was 4 percentage points below the target. Two factors played a role in this stage: counter-inflationary shocks – a combination of global and idiosyncratic shocks – teamed with the introduction of a new forecasting system that, instead of expert analyses, relied on model forecasts complemented with expert corrections utilizing short-term forecasts and ad hoc empirical analyses. At this time, the decision-making process apparently ceased to be a source of undershooting. As in the previous episode, oil and food prices dropped and industrial producer prices slowed prior to the target undershooting. Moreover, other IT central banks also undershot the inflation target (in 8 out of 10 sample countries inflation was below the midpoint). Global counter-inflationary shocks were buttressed in 2002–2003 by another surprise nominal koruna appreciation and an unexpected – from the forecast-system perspective – deceleration in the pace of price deregulation.

The forecasting system contributed to undershooting during the second stage. On the one hand, the system overestimated virtually all inflation factors at the time of its introduction in the summer of 2002, owing to the effects of expert interventions in the near-term forecast and an unwillingness to revisit the forecast assumptions in a timely manner. On the other hand, the decision-making process put a comparatively bigger emphasis on the model-based forecast, increasing the system's transparency and gradually its role in the policy debate. Policymakers and forecasters started focusing on explicit assessment of various forecast risks, generating more frequent and more pronounced corrections in the monetary stance than those generated by experts in the first stage.

During the third, most advanced stage, inflation deviated from the target in particular in late 2006 and early 2007, although this deviation (2 percentage points) was smaller than in earlier episodes. The authors argue that this deviation can be explained by the re-emergence of counter-inflationary shocks during 2005 that the forecasting system failed to anticipate and incorporate. The forecasting system repeatedly

[7] The need for credibility in the late 1990s is easy to underestimate in present conditions. It is important to keep in mind that the memories of the 1997–1998 turbulence were still fresh at that time (Šmídková et al., 1998).

TABLE 2 Factors Behind the Inflation Deviations in the Three Stages of Inflation Targeting in the Czech Republic

	Initial stage (without QPM, disinflation)	**Advanced stage (newly with QPM, disinflation)**	**Standard stage (QPM+, stabilisation)**
	1998–2001	**2002–2004**	**2005–2007**
Counter-inflationary shocks	**1 2 3 4 6***	**1 2 3 4 6***	**3 4**
Forecasting system	**3 4***	**3**	**3 4***
Decision-making process	**2 4* 5**	**4** *5*	**4*** *3 5*
Inflation expectations	**6***	**4* 6***	**4***

Note: Each cell of the table sets out in **bold** those articles in the volume whose authors consider the respective factor significant for the deviation of inflation from the target during the respective stage. *Italic*, on the other hand, is used to denote those articles that dismiss the respective factor as a source of deviation. For some of the papers, the adopted methodology prevents differentiation of two factors from each other. In that case, both factors are set out with an added asterisk. QPM is a model that has been part of the forecasting system since 2002. QPM+ refers to an extended version of QPM.

overestimated food-price inflation and underestimated the exchange rate appreciation (as did other domestic institutions). On the modeling side, the forecasters struggled with defining equilibrium trends, such as potential output growth, and with interpreting supply-side developments in a fast-converging, transition economy. It was arguably a more difficult modeling environment as compared to industrial economies. On the positive side, the decision-making process was now fully focused on the assessment of forecast risks and played a distinctly corrective role within the forecasting system, moderating the extent of the 2006–2007 undershooting. Needless to say, stability of inflation expectations contributed to decreasing inflation, since these had integrated the experience of the target undershooting from the previous two stages and assumed inflation that was lower than the official target.[8]

* * *

The undershooting of inflation targets in the Czech Republic during 1998––2007 cannot be explained by a single factor. Counter-inflationary shocks, such as declines in global prices of oil and food and the sharp and unexpected appreciation of the Czech koruna, were identified as the most frequent source of inflation deviations from the target. The series of such shocks was buttressed by the initial rigidity of the forecasting system. While the former cannot be prevented by a central bank, the latter can be avoided through improvements in the forecasting system. One important lesson is that a strategy of frequent, robust changes to the forecasting system is superior to the strategy of slow adaptation. The findings in this volume suggest that a less rigid forecasting system supports the decision-making process better. The CNB has followed this approach – by introducing the extended modeling framework (QPM+) in 2005, by making more frequent changes to the forecast assumptions (for example, to the pass-through from prices to inflation expectations), and finally by changing over to a new dynamic general equilibrium (DGE) forecasting model (G3) in 2008.[9]

[8] Empirical estimates may identify potential differences between the official target and the target as seen by the public. The latter was presumably lower than the official one in the Czech case; see (Franta, Saxa, and Šmídková, 2007) and (Hurník, Kameník, and Vlček, in this volume).

The other lesson we draw is that a model-based forecasting system successfully structures the monetary policy discussions and pins down the core scenario of economic development. The CNB's 2002–2007 experience highlighted the benefits of inflation forecasts as an input into policy discussions, especially if the forecast is accompanied by explicit discussions of the forecast risks. We see two reasons for focusing on forecast risks during monetary policy deliberations: first, the policy-maker often has a larger and more recent set of information than that available to the experts at the time of preparation of the forecast, and, second, there is inevitable uncertainty related to the model assumptions (Šmídková, 2005). Forecast risk assessment is probably the best insurance against asymmetric monetary policy.

The final lesson is that the Czech experience is consistent with IT as a technology for managing inflation expectations. As compared to the early stage of inflation targeting, CNB communication has gradually developed into a full-fledged tool of monetary policy, complementing the impact of policy interest rates and enhancing the efficiency of Czech monetary policy.

[9] The G3 model was outlined in (Benes et al., 2005).

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