

## CHAPTER 1

**EVALUATION OF THE FULFILMENT OF THE CNB'S INFLATION TARGETS  
1998–2007**

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**THE ORIGIN OF THIS VOLUME**

The anniversary volume *Evaluation of the Fulfilment of the CNB's Inflation Targets 1998–2007* contains analyses by experts of the central bank prepared at the turn of 2007 and 2008 that provide an overview of the elapsed ten years of inflation targeting in the Czech National Bank (CNB). The analyses were primarily concerned with identifying the factors that most significantly drove inflation away from the CNB's inflation targets over the past decade. The analyses also supplied a number of additional discussion ideas, whether through international comparison of achieving inflation targets or institutional comparison of inflation forecasts.

The volume includes nine papers that analyse the central theme with the help of various methodologies. The papers cover three stages of inflation targeting. 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 models. This initial stage was followed by the advanced stage (2002–2004), during which the disinflation continued. The CNB implemented a new central component into its forecasting system - the new forecasting model (QPM). Finally, for the standard targeting stage (2005–2007) the CNB declared a horizontal target. In this stage, the monetary policy documents are based on a fully developed forecasting system with the extended version of the central forecasting model (QPM+).

Only some of the papers span all inflation targeting stages. Others concentrate on the later stages, as the methodologies employed by them require a wider data base unavailable for the initial stage.

This chapter has been written as a guide to this volume, with the aim of assisting the reader in developing a methodology-independent view of the factors that were diverting inflation from the CNB's inflation targets during the individual inflation targeting stages.

**POTENTIAL FACTORS AFFECTING INFLATION DEVIATIONS FROM THE TARGET**

Any central bank targeting inflation has to cope with deviations of inflation from the target. Over the past decade, inflation for the selected sample of central banks deviated from their targeted bands in 47% of cases<sup>1</sup>. The Czech experience with inflation targeting was different in the initial and advanced stages. That is why the frequency of fulfilment of the target was lower for the whole decade under review - 34% (see Table 1). What also made the Czech experience distinct from the sample was the asymmetry of deviations during the first decade of inflation targeting. While inflation for the sample of central banks was above the target in half of the cases and below it in the other half, basically only downward deviations could be observed in the Czech case. This asymmetry, accompanied by a higher frequency of deviations from the target in the initial and advanced inflation targeting stages, was a motivation for researching into the factors causing inflation to deviate from the target. Comparison of the more recent Czech experience with that of the sample of countries shows that the Czech inflation targeting matched international standards. During the standard stage of inflation targeting, inflation moved away from the target in 50% of cases. Moreover, the current inflation shows that the distribution of the inflation deviations might steadily converge into a symmetric distribution.

<sup>1</sup> The selected sample of countries is described in Chapter 2 of 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: The scope of undershooting inflation targets**

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: A target is considered an entire band in this table. 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 standard stage. Therefore, the declared tolerance band has been used in this table. The table employs quarterly data; the distribution would look somewhat different if monthly data were used, while several instances of an overshoot Czech inflation target would also occur in that case.

From the outset of the analytical works, the CNB Bank Board asked experts to assess the impact of potential factors that could be behind the asymmetric deviations of inflation from the target. These were mainly the following three factors: (i) the target undershooting might be caused by a series of anti-inflationary shocks, (ii) the forecasting system might be the cause of undershooting, and (iii) the decision-making system itself might cause undershooting. Since inflation targeting has recently often been associated with “managing“ inflation expectations<sup>2</sup>, the role of expectations, too, was examined together with the above mentioned three factors<sup>3</sup>. It has been obvious since the beginning of the analytical works that interpretation of their results will be somewhat difficult. The point is that the factors may cause inflation deviations in concurrence and their relative importance may even be subject to change over time, but no methodology is capable of evaluating all the factors at once. The authors of the contributed papers therefore mostly concentrated on selected factors and selected inflation targeting stages - always taking the employed methodology into account. Obtaining conclusions, independent of the chosen methodology, requires a comparison of the conclusions from all papers on the roles of the analysed factors.

### THE FOCUS OF CONTRIBUTED PAPERS

The first three papers, including *Basic Characteristics of Inflation Targeting in the Czech Republic* (Chapter 2), *A Simple, Model-independent Analysis of Reasons for Non-fulfilment of the Declared Inflation Target* (Chapter 3) and *Causes of Deviations of Inflation from CNB Targets – An Empirical Analysis* (Chapter 4), provide an introduction to assessing fulfilment of the CNB inflation targets during the period of 1998–2007. As they have adopted relatively simple methodologies that are less data demanding than the models applied in further papers, they are therefore able to cover the entire period under review. The conclusions of this first set of papers, given the simplicity of the chosen methodologies, are also relatively independent of model assumptions. A price paid in exchange for these two strengths of the foregoing papers (a relative model independence and the entire targeting decade coverage) is rooted in an inability to differentiate all potential factors in

<sup>2</sup> A credible monetary policy may use communication as a complementary tool to the policy interest rates, and to directly manage inflation expectations; see Eusepi, Stefano, and Preston (2007).

<sup>3</sup> These factors were classified as working hypotheses in the course of the analytical works, and some of them are actually tested in the papers. The names of the hypotheses were as follows: (i) the surprised central bank hypothesis; (ii) the hypothesis of the skewed sight; (iii) the asymmetrically considered target hypothesis; and (iv) the overly credible target hypothesis.

detail. The papers can discern between two major sets of factors only – shocks and other factors. It is apparent from the conclusions of these introductory papers that inflation targeting was successful with respect to the disinflation process and ensured a low inflation rate for the Czech economy. Several episodes of more distinct deviations in inflation from the target may be identified during the past decade, mostly related to anti-inflation shocks, both global and specific to the Czech economy. Also, periods of inflation target undershooting are identified that occurred even though no marked anti-inflation shocks were present, suggesting that there may also have been a role to play for the forecasting system or decision making process in these episodes. An international comparison indicates that the Czech experience is in no way unique and that other transition economies were also hit by significant shocks and deviated from inflation targets.

The next four papers, including *Prediction Bias and Undershooting of the Inflation Target* (Chapter 5), *Inflation Forecasts Errors in the Czech Republic: Evidence from a Panel of Institutions* (Chapter 6), *Evaluation of the Quality and Success Rate of Forecasts – A Historic Overview* (Chapter 7) and *The History of Inflation Targeting in the Czech Republic through Optic of a Dynamic General Equilibrium Model* (Chapter 8), employ more intricate methodologies that enable more detailed discussions of separate inflation deviation factors. These more structured discussions increased data demand, and limited some of the analyses only to the later stages. This also leads to a certain degree of dependence of the conclusions on the adopted model and its assumptions. Similarly to the first set of papers, this second set with a more structured view of the factors of inflation deviations also attributes a significant role to the anti-inflation shocks, irrespective of the chosen methodology. The CNB's forecasting system probably also played a certain role, in particular during the first two stages of inflation targeting. Given the similarities between the deviations recorded by the CNB's forecasting system and systems of other Czech analytical institutions, the role of shocks appears dominant. The model analyses further support this interpretation, although it is impossible to discern in certain instances whether the respective impact resulted from the forecasting system or the decision making process. A more prominent role was attributed to the forecasting system where such differentiation was possible. The reason given is that, during the advanced targeting stages in particular, decisions on the monetary policy interest rates were quite close to the suggestions of experts based on the forecasting system itself. If the decision making process contributed to the deviations, it was rather due to too small a correction of the forecasting system.

Two final papers, *Asymmetric Monetary Policy in the Czech Republic?* (Chapter 9) and *Reasons of Undershooting the Inflation Target in the Czech Republic: The Role of Inflation Expectations* (Chapter 10), are both concerned with one specific factor of inflation deviations. Both factors – the asymmetry of the decision making process and role of expectations - are actually difficult to analyse using the methodologies adopted in the previous papers. These complementary analyses indicate that the decision making process may have contributed to undershooting of inflation targets due to its asymmetry in the initial targeting stage. During this stage, CNB used two target types (short-term and medium-term)<sup>4</sup> and might therefore consider an inflation drop below a short-term target, in an environment of global deflation shocks, as a quicker and cost-efficient way of achieving a medium-term target (i.e., practising opportunistic disinflation). Alternatively, the CNB might have been concerned that a decrease of the policy interest rates (which would have been required to compensate for the deflation shocks) would have caused depreciation of the Czech koruna, which

<sup>4</sup> One-year and three-year inflation targets were declared in the initial stage of inflation targeting; see Šmídková and Hrnčíř (1998).

would have put the credibility of the new inflation targeting strategy at risk<sup>5</sup> at a time when the memory of exchange rate turbulences was still fresh<sup>6</sup>. Apparently, empirical results suggest that the Czech monetary policy anchored the inflation expectations<sup>7</sup>, and that the inflation expectations were not a primary factor behind the inflation deviations. Anti-inflation shocks, however, were reflected with relative significance in the expectations; hence, expectations might play a certain secondary role in undershooting the target.

#### POTENTIAL FACTORS BEHIND THE INFLATION DEVIATIONS FROM THE TARGET

Although there are methodological differences between the contributed papers, together they provide a sound basis for compiling an overview of the most frequently identified factors behind the asymmetric deviations of inflation from the target (Table 2)<sup>8</sup>. Two key conclusions follow from this overview: (i) undershooting of inflation targets in 1998–2007 cannot be explained by a single factor, and (ii) individual factors possessed different degrees of importance during different stages of inflation targeting. Each stage involved a combination of factors. Anti-inflation shocks are the most frequently identified source of the deviations. The second next significant source, specifically during the initial and advanced targeting stages, was probably the forecasting system. The decision making process about the policy interest rates, on the contrary, is the least frequently identified factor. Interestingly, the role of the decision making process was the most dynamic one over time. While, in the initial stage, it is seen as a factor that might have added to undershooting of the inflation targets, the authors of the papers even dismiss it as a potential source of deviation in the later inflation targeting stages.

The most marked deviation from the target (by up to 6 percentage points at the most) over the past decade was observed in the initial stage of inflation targeting. The deviation was caused by a combination of three factors: (i) global anti-inflation shocks, (ii) the rigidity of the forecasting expert system, and (iii) opportunistic disinflation. Global shocks pushed inflation the furthest below the target and as the first in the time order. At that time, prices of oil and food decreased significantly and there was even a drop in the global industrial producer price index. This global decrease of prices previously occurred for the last time in 1986–87. In addition to the CNB, other countries within the selected sample of the inflation targeting central banks also undershoot inflation (7 out of 10 went below the target midpoint). Certain domestic shocks additionally joined the global shocks. The Czech koruna appreciated sharply and unexpectedly. Subsequently, problems of the then forecasting system were revealed, as the system responded slowly to new information or repeatedly indicated it probable that the decreasing global prices would shortly reinstate their pace from the first half of the 1990s and that pass-through of the appreciating

<sup>5</sup> The necessity to maintain the credibility of monetary policy was on the agenda of the Bank Board, e.g., in March 1998; see CNB (1998).

<sup>6</sup> At that time, the International Monetary Fund warned that a strategy based on a credibility built using own efforts (instead of being imported with the help of an exchange rate fixation) might fail under the Czech circumstances; see IMF (1998).

<sup>7</sup> Empirical analyses document that inflation targeting anchored expectations in the Czech economy, although inflation deviations from the target were comparatively frequent; see Holub and Hurník (2008).

<sup>8</sup> Table 2 presents a simple “meta-analysis” of the contributed papers. A meta-analysis is currently a popular tool wherever answers are sought to difficult questions in economics, the apparent big problem of which consists either in (i) a dependence of results on a model (model dependence), or (ii) doubts as to the correct model (model uncertainty), or even (iii) non-existence of a model capable of describing the entire problem (only partial analyses are available). Identification of factors behind the inflation deviations falls under this category.

exchange rate into inflation would be relatively weak. The opportunistic disinflation policy was practised in the anti-inflation shock environment. In addition to that, a relevant concern existed during the first year of inflation targeting that an excessively accelerated decrease of the interest rates could cause a loss of credibility in the monetary policy and return of exchange rate turbulences<sup>9</sup>.

**Table 2: Factors behind the inflation deviations in 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
<b>Anti-inflation shocks</b>	2 4 5 8 10*	2 4 5 6 8 10*	5 6 7 8
<b>Forecasting system</b>	3* 8* 5	3 5 6	3 5 6 7* 8*
<b>Decision-making process</b>	3* 4 8* 9	8	8*
<b>Inflation expectations</b>	10*	9	3 9
		7 8* 10*	7* 8*

*Note: Each cell of the table sets out in red those chapters of the volume whose authors consider the respective factor significant for an inflation deviation from the target during the respective stage. Green, on the other hand, is used to denote those chapters 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 integrated within the forecasting system since 2002. QPM+ refers to an extended version of QPM.*

During the advanced inflation targeting stage, inflation took the furthest departure from the target in 2003. This episode represented the second largest deviation over the ten-year period (by 4 percentage points at the peak). An interaction of only two factors was material at this stage. Anti-inflation shocks – which involved a combination of global and specific shocks – teamed their impact with the introduction of a new forecasting system that, instead of expert analyses, relied on the model forecasts complemented with expert corrections. These corrections were based on the short-term forecasts and partial empirical analyses. The decision making process already ceased to be a source of undershooting in this targeting stage. Once again, global shocks played an important role, as the prices of oil and food dropped and industrial producer prices slowed down during the year preceding the target undershooting. And once again, other countries also undershot the inflation target (8 out of 10 countries below the midpoint). Specific shocks included the koruna strengthening in 2002–2003. The currency appreciation was a surprise to all domestic institutions at that time, and is therefore classified as a shock. Specific shocks also included a surprising (from the forecast system perspective) deceleration of the pace of price deregulations in 2002–2003. The forecasting system contributed to inflation undershooting in this stage, too. In fact, the system distinctly overestimated all inflation elements at the time of its introduction (summer 2002), partly due to the effects of expert intervention with the newly introduced model. In addition, there was still some rigidity as to revaluation of the forecast assumptions. At the same time, the decision

<sup>9</sup> The importance of credibility may be underestimated across the ten-year period. It is important to keep in mind that exchange rate turbulences and their consequences were still very fresh in the memory at that time; see Šmídková et al (1998).

making process put a comparatively bigger emphasis on the forecast developed by the forecasting system, since integration of the central forecasting model into the forecasting system increased the system transparency and consequently its role in the monetary policy debate. At this stage of inflation targeting, the decision making process started focusing on explicit assessment of the forecast risks. This risk assessment gradually led to more frequent correction of the monetary policy suggestions that experts put forward after producing the forecast.

During the standard targeting stage, the most marked inflation deviation from the target occurred at the turn of 2006 and 2007. However, it was the least deviation over the ten-year period (by 2 percentage points at the peak). Key for this deviation, once again, was interaction of anti-inflation shocks and the prognostic system, which was encountering problems in 2005<sup>10</sup>. However, the decision making process was already fully focusing on the forecast risks at this stage. As a result, the decision making process played a much more distinct corrective role in the forecasting system and was moderating undershooting rather than contributing to it. In this stage, inflation expectations probably contributed to decreasing inflation, since they could already have integrated the experience of the target undershooting from the previous two stages<sup>11</sup>.

### CONCLUDING REMARKS

The findings obtained from the contributed papers are further utilised by the CNB experts when they implement the inflation targeting strategy. Although the initial decade of inflation targeting was characterised by a comparatively atypical asymmetry in inflation deviations from the target, the CNB experts strive to generalise the obtained findings in order to utilise them in the forthcoming years of inflation targeting implementation.

Undershooting of inflation targets in 1998–2007 cannot be explained by a single factor. Anti-inflation shocks are the most frequent source of deviation of inflation from the target. The experience from the previous decade indicates that in the case of large shocks, the rigidity of the forecasting system can also play an important role in inflation deviating from the target. While external shocks cannot be prevented by any central bank, the work with the forecasting system can be changed.

From this point of view, it is important to emphasize that a strategy of more frequent changes in a forecasting system is more beneficial than the strategy of slow adaptation to new information. A less rigid forecasting system supports the decision making process better. The CNB has already begun to follow this approach – by introducing the extended QPM version in 2005, by more frequent changes to the forecast assumptions (e.g. on the pass-through from prices into inflation expectations) and by introducing a new forecasting model (G3).

The forecasting system with the central forecasting model is highly beneficial for structuring the monetary policy discussions and for setting up the core scenario of the economic development. The experience from 2002 and 2005 highlighted that the forecast is an input into monetary policy

<sup>10</sup> The forecasting system repetitively overestimated the increase of food prices, underestimated the exchange rate appreciation (as all domestic institutions did) and had problems with defining equilibrium trends or with describing the supply side of the economy. These problems are particularly related to the non-standard development of the Czech economy, which is still an economy in convergence. It is therefore much more difficult, compared to fully developed economies, to empirically describe the equilibrium trends and supply side of the Czech economy.

<sup>11</sup> 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, Šmídková (2007).

discussions and that the second topic for these discussions should be the forecast risks<sup>12</sup>. It is important that the decision making process focus on assessing these risks and that it correct monetary policy suggestions, based on the forecast, in the case of their asymmetric distribution around the core scenario.

Inflation targeting is increasingly considered a strategy that should manage inflation expectations. In this respect, the Czech experience of inflation targeting corresponds to the international findings. Compared to the initial stages of inflation targeting, communication has gradually developed into the second tool of the monetary policy that complements monetary policy interest rates and enhances the Czech monetary policy efficiency.

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<sup>12</sup> There are two significant reasons for focusing on forecast risks during monetary policy meetings: (i) the Bank Board members often have a larger and more recent set of information than that available to the experts at the time of preparation of the forecast, and (ii) there is uncertainty related to the model assumptions; see Šmídková (2005).