

# Inflation Targeting as a Stabilisation Tool: Its Design and Performance in the Czech Republic

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This year marks not only ten years of independent monetary policy of the Czech National Bank (CNB), but also five years of the Inflation Targeting (IT) framework in the Czech Republic. This is a good opportunity to look back and analyse how the regime has evolved and what overall results it has brought. Accordingly, the goal of this paper is twofold. First, we discuss why the policy framework evolved the way it did in different time periods. Second, we ask if the evolution of the policy framework is mirrored in the performance of monetary policy, we discuss how the performance could be evaluated and offer some results.

The paper is divided into three chapters. The first chapter examines the evolution of the regime design. After briefly reviewing the starting conditions, we ask why the inflation targets were defined in the specific way and why the given target horizon was chosen. We then shortly describe the challenges of targeting inflation in a small open economy and show what tools may be available to efficiently manage them. The second chapter analyses whether the regime changes translated into the performance of Czech monetary policy in the past years. We first concentrate on different approaches that are available to evaluate the performance of monetary policy. Following this discussion we consequently offer three different ways of evaluating the performance of the IT period of the CNB. In the last chapter we briefly summarise our findings and offer a glimpse into the future of IT in the Czech Republic.

## 1. The Evolution of the Regime Design

In this chapter we discuss the key issues that have determined the design of the IT regime in the last few years in the Czech Republic. The is-

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sues are discussed in chronological order as they arose in practice. We first briefly review the developments that led to adopting the IT framework. We then proceed to discuss the definition of the targets in terms of their horizon. The next part of this chapter focuses on the possibilities of dealing with supply shocks in small open transition economies and analyses what part of the CPI basket the inflation targets should cover. The last two parts of this chapter discuss the definition of price stability and a recent move of the CNB's IT strategy towards a "full-fledged" IT regime.

The introduction of Inflation Targeting in the Czech Republic may be seen as a reaction to economic turmoil of 1997. In that year, the fixed exchange rate regime of the Czech koruna was abandoned after more than seven years due to a speculative attack. The reasons for this had been accumulating for several years. After the Czech koruna was made fully convertible in October 1995, a positive interest rate differential and a fixed exchange rate attracted high capital inflow. The capital inflow not only pushed the mixed fixed exchange rate and monetary targeting strategy of the central bank deeper into a vicious "sterilisation trap" but – combined with generous wage policies and later fiscal overspending – it soon manifested itself in roaring excess demand. The excess demand seeped primarily through growing current account deficits as many durables were not produced internally and inflation was kept low by the fixed exchange rate. The fragility of the Czech balance of payments was made very visible to foreign market participants during the 1997 Asian crisis and a speculative attack on the koruna was launched in the spring of that year. The CNB was not able to counteract the attack using standard tools and the authorities were forced to let the koruna float at the end of May 1997. Needless to say, the exchange rate turmoil was highly destabilising for the economy. The increase in tradables prices following the 10-percent depreciation of the koruna, combined with unfortunately timed freeing of regulated prices, the so-called "deregulation" (see Figure 1), led to a doubling of CPI inflation rate between mid-1997 and the beginning of 1998, notwithstanding the quickly opening negative output gap. This development of inflation and the absence of a nominal anchor in the economy understandably drove up inflation expectations. The low efficiency and credibility of the previous monetary targeting strategy, persistent and high inflation expectations and the experience of countries directly targeting inflation led the CNB to establish Inflation Targeting as a framework for monetary policy in January 1998.<sup>1</sup>

## 1.1 How to Define the Targets?

Although the short-term objective of introducing IT was to stabilise inflation after the 1997 turmoil, the main goal in the medium to long-

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<sup>1</sup> See (Dědek, 2000) for an analysis of the 1997 exchange rate turmoil and (Hrnčář – Šmídková, 1999) for a discussion of the reasons for introducing IT.

-term was to stabilise prices, i. e. decrease inflation. The disinflation process was clearly defined by a medium-term target that the CNB announced together with the introduction of the regime in December 1997. The choice of IT as a disinflation strategy was relatively new at the time, since most countries that had introduced IT before had done so only after inflation was under control or on a downward path. Little international experience and structural changes in the economy made it difficult to back the decision on the speed of disinflation by rigorous calculations on properties such as sacrifice ratio and the like. After some analyses, the CNB committed itself to setting its monetary policy instruments so as to achieve annual net inflation of 4.5 percent with an interval of  $\pm 1$  p. p. by the end of 2000. Since inflation was at around 10 percent in the end of 1997, arithmetically this meant decreasing inflation by about 2 percentage points a year. However, since the spike in inflation at the end of 1997 and the beginning of 1998 was perceived as a temporary phenomenon, the actual disinflation was not to be so steep. This was reflected in the short-term target that the CNB announced at the same time as the medium-term target: net inflation of 6 percent with a narrower interval (reflecting smaller uncertainty) of  $\pm 0.5$  p. p. for the end of 1998. In November 1998, another short-term net inflation target of 4.5 percent with a  $\pm 0.5$  p. p. interval was set for the end of 1999 (see Table 1).

The initial design of the regime had three distinct and later abandoned features: (i) *short-term* targets that were defined for (ii) *year-to-year inflation in December* in terms of (iii) *net inflation*. Let us now briefly discuss the rationale behind the first two features; net inflation will be discussed in the next section.<sup>2</sup> First, the idea of short-term targets was often debated not only by outside observers (see e. g. (Čihák – Holub, 1998)) but also internally. Specifically, this debate concerned the targets for 1998 and 1999 that were announced only 12, respectively 13 months ahead. Opponents to this approach said that since the targeted horizon roughly matched the estimated monetary policy transmission lag (12–18 months), these targets were more forecasts of inflation than an actual guide to setting the central bank's interest rate. On the other hand, the short-term targets reflected the credibility concerns of the period. The one year-ahead time horizon corresponded with the average duration of nominal contracts, which could be useful while attempting to anchor inflation expectations especially in wage negotiations. The second distinct feature was that the targets were set in terms of year-to-year inflation for December. This would perhaps not be discussed in economies with stable inflation rates. In the Czech case some argued that monetary policy would concentrate too much on the December figure and could even employ one-off foreign-exchange interventions to ensure fulfilling the target through the direct exchange rate channel. This was never the case but it is true that the year-end specification of the targets made them perhaps more difficult to communicate to an ex-

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<sup>2</sup> See (Schaechter et al., 2000) for an international comparison of targeted horizons and indices.

pert audience than if average inflation rates for a given year were chosen. This is especially so since the targets were designed to roughly mark the disinflation path without aiming at reaching exact numbers in exact months of the year – a notion that the year-end targets certainly provoked.

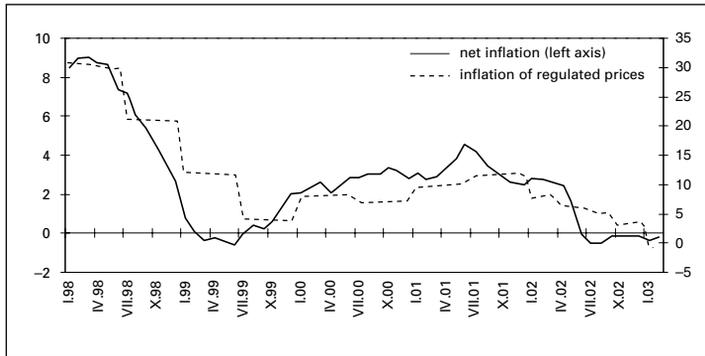
## 1.2 Net Inflation and Regulated Prices

The third distinct feature of the initial framework was that only a part of the CPI basket was targeted in the first period since 1998. As the reason behind this feature is an important phenomenon of pursuing IT in a small open economy, let us briefly describe the problem on a more general level. This debate arises in connection to communication difficulties that monetary policy-makers have in responding to supply shocks. On the one hand, since strict reaction of IT central bank to a supply shock could trigger undesired fluctuations of output, one would like to abstract from the primary effects of supply shocks in the decision making process. On the other hand, not responding to supply shocks may lead to missing the target. Given the cause, this would be acceptable by experts in the field but may actually negatively affect the bank's credibility among the general public. This communication difficulty often leads central banks to either exclude some items (connected to supply shocks) from the targeted index or introduce the so-called "caveats" or "escape clauses" to fulfilling the target or both. Neither solution is, however, without problems. First, unless the central bank is successful in making everyone in the economy link the word "inflation" to the narrower index, it is almost impossible to influence expectations by something just a few economists can disentangle. This might be why only one quarter of IT central banks do actually target a different price measure than the headline inflation (Schmidt-Hebel – Tapia, 2002). As for the escape clauses, apart from some difficult conceptual issues (such as an *ex ante* versus *ex post* approach to interpreting them), they could be understood by the public as cheating on the part of the central bank's commitment. In other words, the more exceptions one defines from a commitment, the less binding the commitment seems and the lower credibility it is likely to have. Decreasing credibility of the inflation target again means less impact on expectations, a cornerstone of IT. In the case of small open economies in transition, monetary policy is likely to face many supply shocks, which then makes this communication issue quite relevant. In the Czech case, the CNB went through an evolutionary process. At first only a narrower index was targeted – specifically until 2001 the CNB had targeted the so-called net inflation that excluded 18 percent of the CPI basket items that were regulated by the government (e. g., energy prices and rents)<sup>3</sup>. Later, as will be described below, escape clauses were added and even later the narrower

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<sup>3</sup> For analytical purposes even a narrower measure of "core inflation", defined as net inflation minus the influence of food prices, has been used. This index accounts for only 54 percent of the CPI basket, which would mean even smaller chances to influence inflation expectations should it be chosen as the targeted index.

FIGURE 1 Net Inflation and Inflation of Regulated Prices



index was abandoned for a headline inflation index and two more escape clauses were added.

Before moving on to examine the consequent changes of the IT regime design, let us briefly mention the relationship between net inflation and the remaining part of the CPI basket – regulated prices. Examining *Figure 1*, one can clearly see the positive correlation between net inflation and the inflation of regulated prices. The reasons might be threefold. First, the net inflation measure includes indirect effects of deregulations. These are, however, not strong enough to lead to the observed correlation. Second, some regulated prices are steered according to market conditions – sometimes only an upper limit is given or prices are adjusted to allow monopolies to realise a rather disputable “adequate profit”. This way of regulating prices has been applied, however, to a larger extent only since cross-financing of energy consumption between enterprises and households was abolished in 2001.<sup>4</sup> Third, the correlation might be unfortunate but rather accidental: deregulation steps were motivated by political factors that happened to lead to the observed correlation. Whatever the reason, it is clear that the deregulation policy of the government was unfortunate in that it contributed to higher inflation volatility throughout most of the IT period.

### 1.3 The Definition of Price Stability and “Escape Clauses”

The first adjustment, or one could say “prolongation”, of the regime design was undertaken in April 1999 when the *CNB Monetary Strategy* (see (CNB, 1999)) document defined what the CNB understands by price

<sup>4</sup> Functioning in the opposite direction is a possible negative income effect: deregulations mean a rise in the prices of goods or services that are difficult to substitute (so-called necessities) and this implies, *ceteris paribus*, a smaller income to be spent on other goods and prices. Smaller demand for these goods could trigger a fall in some of these prices, inducing a slow-down in net inflation. It is, however, impossible to disentangle this effect from the crude figure below.

stability and when it should be achieved. The document did not attempt to change the goal of the central bank, which was according to constitution law “monetary stability” (the term was replaced by “price stability” only in May 2002). Its aim was to define “price stability” quantitatively, which also meant prolonging the disinflation path into the future.<sup>5</sup> The CNB announced that price stability is to be understood as net inflation rate of 2 percent with a 1-percentage point band and is to be met by the end of 2005. According to CNB (1999a), the idea behind this number reflected (i) that low inflation is one of the key conditions for sustainable growth, and at the same time that it is highly valued by society; (ii) the specific conditions of a small and very open economy tightly inter-linked with the EU; (iii) the rate of progress towards price and monetary stability and necessary structural adaptations, particularly the adjustment of relative prices and the catching-up process; and (iv) consistency with the strategy for the integration into European institutions and EMU accession.

Following the discussion in the preceding section, the document also contained additional factors that the CNB would regard as not encompassed by the target commitment and hence not requiring a policy response. These are referred to as “caveats” or “escape clauses” to the commitment to a specific numerical target.<sup>6</sup> The CNB specified these to be: major deviations of world prices of raw materials, energy-producing materials and other commodities from the forecast; major deviations of the koruna’s exchange rate that are not connected with domestic economic fundamentals and domestic monetary policy; major changes in the conditions for agricultural production having an impact on agricultural producer prices; natural disasters and other extraordinary events having cost and demand impacts on prices.

Together with refining the design of the regime by definition of price stability and escape clauses, the document also anchored the way the CNB planned to set targets in the future. Namely, it was established that from then on the targets would be set 20 months ahead. This horizon reflected two concerns. First, April is a month when preparations of next year’s fiscal budget start and by acting first, monetary policy can provide an anchor to the deliberations of the fiscal authority. Second and perhaps more importantly, the decision on the horizon reflected the transmission lags in monetary policy pursuit. This was a step in the direction of really targeting inflation rather than forecasting future inflation.<sup>7</sup> Following the “20 months ahead practice”, a year later, in April 2000, a target was set for the end of 2001 at 3 percent with a  $\pm$  1-percentage point interval around it.

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<sup>5</sup> See (Kotlán, 2001) for a discussion on whether it should be the central bank, the government or the Parliament who quantitatively defines price stability and the speed of disinflation.

<sup>6</sup> In fact the CNB had already made these public a few months before that, while announcing the short-term inflation target for 1999 in November 1998.

<sup>7</sup> This is not to say that forecasts should not be performed while setting the targets. In fact, they are important especially in disinflation since they help to evaluate the desired speed of disinflation (see (Mahadeva – Šmídková, 2000)).

## 1.4 Moving Closer Towards a “Full-fledged” IT

Notwithstanding these refinements of the framework, the year-end targets and net inflation still remained prominent features of the regime. It was only at the beginning of 2001 that a decision was made to move further towards a “full-fledged” form of IT regime that is based more on a medium-term perspective (see (CNB, 2001)). The CNB abandoned both the net inflation index and the practice of year-end targets. The move from targeting net inflation to targeting headline inflation was motivated by three factors. First, the net inflation index was never fully understood by the general public. For instance, in wage negotiations the labour unions would rather refer to last year’s headline inflation than to the target for net inflation for the year concerned. Second, as discussed above, many of the “regulated” prices had gradually started to be set in a manner that reflected the evolution of the rest of the CPI basket. Third, the central bank’s improving communication with the government and demands from the EU resulted in a plan of gradual deregulation of the remaining administrative price controls. Based on this outlook, the CNB conditioned the headline inflation target on the assumption that the contribution of the regulated prices would be within the 1 to 1.5 percentage point per annum.

Apart from abandoning the net inflation index, the new regime design also abandoned the practice of year-end targets. The new target is specified in terms of a continuous and smoothly declining target band. The band was announced starting in January 2002 at 3–5 percent and ending in December 2005 at 2–4 percent.<sup>8</sup> The declining “corridor”, as it is sometimes referred to, reflects the idea that spontaneous adjustments of relative price distortions will be eliminated with decreasing speed. The target was officially declared together with the government, which brought some commitment on the part of the government to respect the target in its medium-term policy decisions and it also increased the credibility of the target. The escape clauses defined previously were amended by two new ones (contribution of regulated prices in the above-mentioned range and abstraction from changes in indirect taxes) and they jointly continue to affect the CNB’s interpretation of whether the targets will be respected in their unaltered form or subject to defined exceptions. *Tables 1 and 2* summarise the target specification together with the time when they were set.

The last change (as of mid-2003) in the regime design was undertaken in July 2002 when the bank decided to switch to a different type of forecasting methodology. In connection with consolidating its internal Forecasting and Policy Analysis System (see (Coats et al., 2003)), the CNB chose to move from a constant interest rate forecast to a forecast which includes an endogenous monetary policy reaction.<sup>9</sup> This move is to reflect the stabilising role that monetary policy has on future eco-

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<sup>8</sup> Note that the 2–4 percent in December 2005 in headline inflation is consistent with the notion of “price stability” defined in 1999 as 1–3 percent in net inflation and the assumed contribution of 1–1.5 p. p. of regulated prices to the headline CPI.

TABLE 1 The CNB's Inflation Targets Set in Terms of Net Inflation

Year	Target (interval around it)	Target month	Set in
1998	6.0 % ( $\pm$ 0.5 p. p.)	December 1998	December 1997
1999	4.5 % ( $\pm$ 0.5 p. p.)	December 1999	November 1998
2000	4.5 % ( $\pm$ 1.0 p. p.)	December 2000	December 1997
2001	3.0 % ( $\pm$ 1.0 p. p.)	December 2001	April 2000
2005	2.0 % ( $\pm$ 1.0 p. p.)	December 2005	April 1999

TABLE 2 The CNB's Inflation Targets Set in Terms of Headline Inflation

	Target range (percent)	Target month	Set in
Range starts	3–5	January 2002	April 2001
Range ends	2–4	December 2005	

conomic fluctuations. In its communication, the CNB verbally expresses what interest rate path is consistent with the current outlook. The forecast of interest rates, however, does not represent any commitment on the part of the central bank as to future interest rates. First, the forecast is based on current information and any future change in the information set will result in a different forecast and a different interest rate path consistent with it. Second, the interest rate trajectory is only a crude expression of the active monetary policy and does not take into account all the fine policy discussions that in the end shape actual policy decisions.

## 2. The Performance of Czech Monetary Policy under IT

Since there is no use in having a regime with “best-practice” design that does not perform well, this chapter concentrates on the performance of Czech monetary policy. Evaluating the performance of monetary policy is a challenging task to which there is no single ideal approach. In this chapter we present three ways of going about this issue. One approach is to examine whether the specific goals in the given strategies have been met: have the money growth targets been met, have the inflation targets been met or has the exchange rate remained pegged within a given corridor? This approach has some caveats. On the one hand, if monetary policy pre-emptively responds to current or expected shocks, these shocks are later not observable from the data. On the other hand, there may be events that monetary policy is not able or not willing to counteract efficiently, such as supply shocks, but which significantly affect the goal variable. This all means that it is difficult to say ex post

<sup>9</sup> See Inflation Report July 2002 for a more detailed explanation of the change and (Skořepa – Kotlán, 2003) for a discussion of the issue of constant interest rate forecasts (so-called conditional forecasts) versus forecasts with active monetary policy (so-called unconditional forecasts).

whether monetary policy responded well to shocks that would have pushed the economy out of equilibrium. However, since comparing inflation with the given inflation targets may seem as the most straightforward way to evaluate the performance of IT, we will attempt this approach in the first part of this chapter.

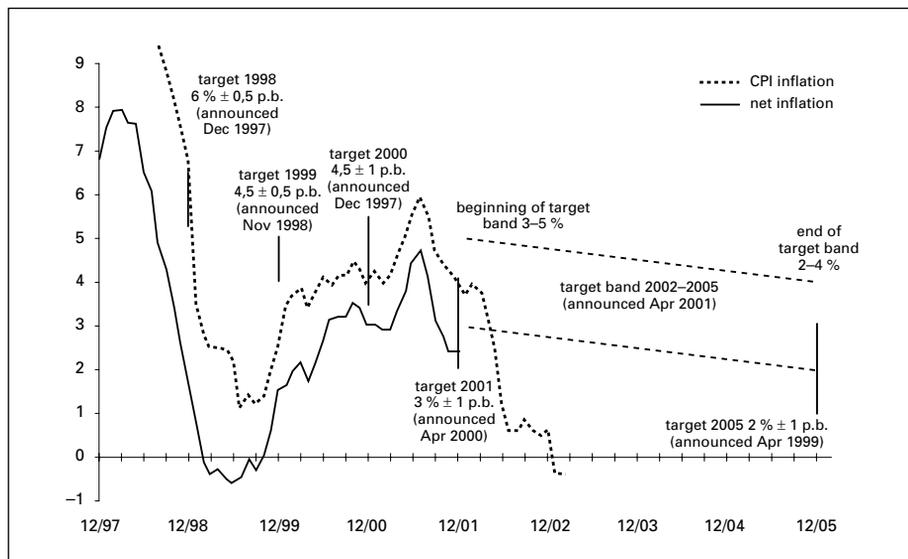
Another approach to evaluate monetary policy is to look at how stabilising it has been for the decision-making of economic agents. This view reflects the premise that the role of economic policy is to stabilise the economic environment in which private agents may then take more efficient decisions. There are several international studies that take this route. Kuttner and Posen (1999) argue that the move towards IT by the Bank of Canada and the Bank of England in early 1990s presented a shift from discretionary to trusted and close-to-optimal state contingent rules (OSCR) for the economy. Laxton and N'Diaye (2002) argue that IT improves credibility of monetary policy. We examine the stabilising role of monetary policy on the decision-making process of agents in two ways. First, we analyse the variability of one-year-ahead inflation expectations compared to the actual inflation development and then the congruency of long-term inflation expectations with the long-term target of monetary policy. Second, as a measure of policy transparency, we examine to what extent the decisions taken by the CNB have been anticipated.

Last but not least, one can examine to what extent the given monetary policy contributed to the final objectives of monetary policy – price stability, and in some cases output stability. This is the approach taken by most studies aiming to evaluate the performance of IT. Several of them, notably the work of Cecchetti and Ehrmann (1999), Nadal-De Simon (2001) and Neumann and von Hagen (2002) argue that the Inflation Targeting framework reduces the variability of inflation without negative effects on the variability of growth. Truman (2003) is a bit more cautious and argues that IT reduces both inflation and its variability with no negative effect on output growth rates except that there is a negative effect on the output variability. Contrary to these studies, Ball and Sheridan (2003) are more sceptical about the possible beneficial effects of IT on inflation or its variability in the long run. The impact of IT on the variability of both output and inflation is the route we take in the last part of this chapter under the so-called *loss function approach*.

## 2.1 Inflation and Inflation Targets

This approach to examining the performance of monetary policy under IT is based on comparing inflation and the corresponding inflation target. Even though it may seem to be a trivial exercise at first, it is not completely the case. In fact there are several reasons in Inflation Targeting, a regime based on forecasts, for why the targets may not be fulfilled. First, the most obvious one: policy was wrong. This means that given a correct forecast, the decision taken was not such that it would assure future inflation would be within the target, all else being equal. For instance a correct inflation forecast would signal a need to increase inte-

FIGURE 2 Inflation of CPI, Net Inflation and Inflation Targets



rest rates but the bank would instead choose to decrease them. The second reason may be that the forecast was wrong.<sup>10</sup> For instance the reason why the forecast signalled a need to raise interest rates was that fiscal loosening was expected but did not materialise in the end. In such a situation, an initially correct policy tightening could lead to undershooting the target. The third reason for missing the target may be that the bank intentionally chose not to fulfil the target. This is related to the reaction of monetary policy to supply shocks discussed in the previous chapter and possibly to the “escape clauses” to fulfilling the target. The fourth reason may be that the central bank could not fulfil the target given its tools. For instance a very strong negative demand shock could require that interest rates go below zero or the shock could come at a time when even the most aggressive reaction would not be sufficient to return inflation back to the target within the given horizon. This discussion shows that understanding why the targets were not met is not trivial. In fact, in practice the reason why a target was missed may be a combination of the above-mentioned reasons among which it is sometimes impossible to distinguish.

In the Czech case, the comparison between the actual inflation rates for the net and headline inflation and the corresponding inflation targets is depicted in *Figure 2*. The figure shows that the net inflation rate was lower than the given year-end net inflation target three times and inside the target once. As for the target corridor, inflation stayed inside the cor-

<sup>10</sup> This reason could be further broken down into two “sub-reasons” connected to creating a forecast: either the exogenous assumptions of a given forecast could be wrong or the transmission mechanism could not be captured correctly.

ridor for four months at the beginning of 2002 and then went below the target.

Since decisions are taken monthly and the CNB's forecasts were also produced monthly for most of the period, it is beyond the scope of this article to analyse every decision within the "four-reason framework" introduced above. Such an analysis is partially conducted in the CNB's Inflation Reports.<sup>11</sup> For this reason, we will limit ourselves only to providing several factors that had – according to the CNB's Inflation Reports – a major influence on undershooting the targets in the given year.

In the first two years of IT (1998 and 1999) there was an extraordinary concurrency of negative supply and demand shocks. On the demand side, the correction of the previous excessive growth achieved by the tightening of both fiscal and monetary policies led to a slowdown of economic growth and later to a recession. The development on the world food market and the remarkable fall of oil prices together with exchange rate appreciation, however, inserted a much stronger downward pressure on inflation than the opening negative output gap. In 1999 the same factors continued to affect price development, most notably falling food prices and the negative output gap that did not allow the propagation of rising oil prices into domestic inflation. In 2000, most of these extreme developments started to fade away, the economy was growing (albeit still below its potential) and inflation started to rise back towards the target. This year is also connected to the so-called "opportunistic disinflation" – a term often used in the literature (see e. g. (Orphanides – Wilcox, 1996) to mark one of the reasons for missing, specifically undershooting, the target that was referred to above. Namely, in the end of 1999 the CNB announced that it would use the disinflation process from the preceding years to stabilise inflation at the attained low levels (see (CNB, 1999b)). In 2001, inflation stayed low and the inflation target was met for the first time. The introduction of the inflation target corridor in 2002 saw inflation within the target only for a few months. In mid-2002 inflation dipped below the target where it stayed until the second half of 2003. The main reason for this development was a strong exchange rate appreciation, a protracted slowdown of the world economy and another period of decreasing food prices. A prominent reason for undershooting the target in 2002 and 2003 has also been a much lower (and again procyclical) contribution of regulated prices to inflation than the 1–1.5 p. p. envisaged while setting the inflation target.

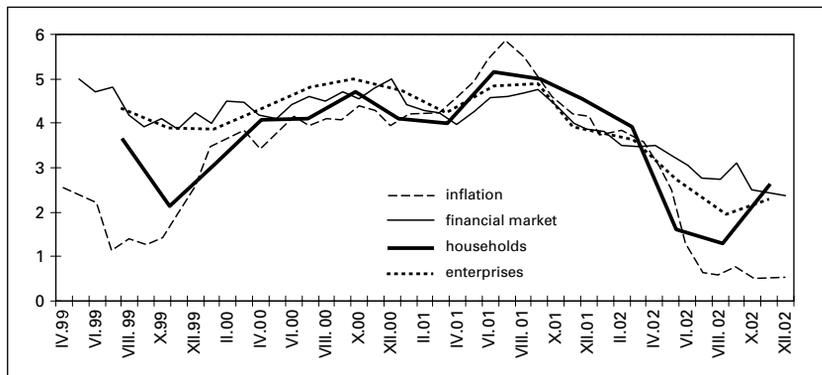
## 2.2 Macroeconomic Stability and Expectations

Another approach to examining the performance of monetary policy is to ask how stabilising it has been for the decision-making of economic

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<sup>11</sup> In particular, every January issue of the Inflation Report examines in detail the fulfilment of the inflation target in the previous year. Since 2002 such an analysis is conducted quarterly which reflects the change from the year-end targets to a system with a continuous target corridor.

FIGURE 3 Inflation and One-year Ahead Inflation Expectations



agents. Since forward-looking agents base their decisions today on the expected future state of the economy, stable expectations mean monetary policy is believed to assure stable future economic development. In general, expectations have a prominent role in monetary policy-making and this is particularly true in Inflation Targeting. First, they have a direct effect on future developments. Second, and more importantly in this context, they are a certain measure of macroeconomic stability. In this section we examine inflation and interest rate expectations.

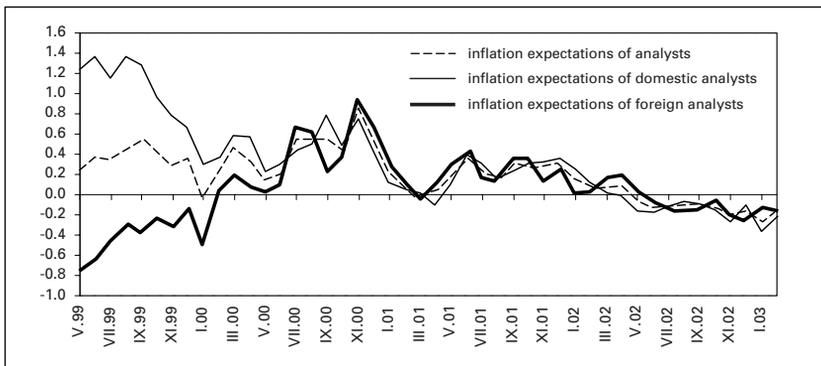
As for the inflation expectations, since there is not a liquid market with indexed bonds in the Czech Republic, survey methods are used. The CNB started to survey financial market analysts on a monthly basis in May 1999 and since September 1999 it has also been surveying inflation expectations of households and enterprises on a quarterly basis. *Figure 3* plots the one-year ahead inflation expectations together with the development of inflation.<sup>12</sup> It is clear from the figure, even without a formal analysis, that inflation expectations are more stable than the actual inflation rate. The fall in inflation in 1999 or 2002 was understood as only temporary, as was the one-off rise in July 2001.<sup>13</sup> In general the figure shows that financial market participants are more resistant to actual inflation developments. This could mean that they are less backward-looking in their expectation formation process than the enterprises or households.

Apart from the one-year ahead expectations, the financial markets participants are also asked what inflation they expect in a three-year-ahead horizon. Because of lags in the transmission mechanism, the three-years-

<sup>12</sup> Until 2002, expectations of households and enterprises were also surveyed for end of the year – following the practice of year-end inflation targets. Since 2003 this question in the survey questionnaire has been replaced by a three-year ahead measure in compliance with the financial markets survey.

<sup>13</sup> The relative stability of inflation expectations would be even clearer if the household's inflation expectations were excluded. The reason they map the actual inflation the most is that the households had been surveyed in the past by first being offered the actual inflation figure and then asked what they expected in 12 months. This practice, which might have led to a more backward-looking behaviour, was abandoned in late 2002.

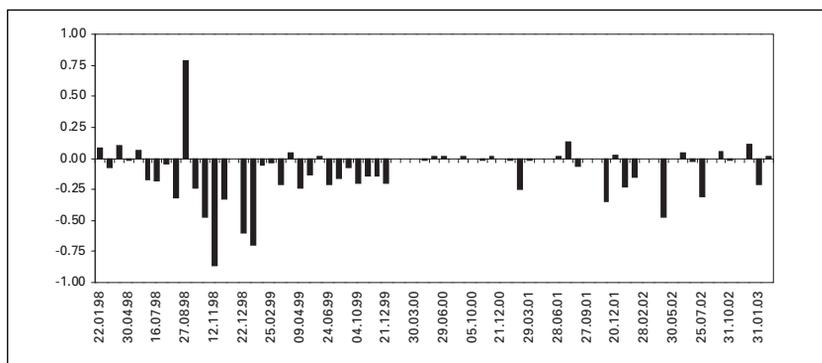
FIGURE 4 Deviation of Three-years-ahead Inflation Expectations of Financial Analysts from Inflation Targets



-ahead inflation expectations are suitable for evaluating if inflation targets are credible and well communicated. If the regime is credible, inflation expectations will be near the targets. *Figure 4* depicts the difference between the three-years-ahead expectations and the corresponding medium-term inflation target in percentage points. Examining the results, one can observe only a very gradual rise in the credibility of the three-year-ahead target. The announcement of the inflation target corridor for headline inflation in April 2001, discussed in the previous chapter, is connected with a subsequent stabilisation of long-term expectations close to the target level with a variance of  $\pm 0.5$  p. p. These findings are in line with the conclusion of Neumann and von Hagen (2002) that IT has a stabilising impact on inflation expectations. Analysing the numbers in greater detail we also examined the behaviour of long-term inflation expectations in two homogeneous groups: domestic and foreign analysts. The behaviour of the two groups has been roughly similar since mid-2000. Prior to that, one can observe that foreign analysts expected the medium-term target would be undershot while the opposite can be said about the expectations of domestic analysts.

Under the expectations heading we next examine the expectations of policy moves by the CNB. Monetary policy is transparent and predictable if the central bank's decisions are generally expected by economic agents. To test for transparency of the CNB's monetary policy, we examine to what extent the policy moves of the CNB have been anticipated. The logic behind our exercise is as follows. If economic agents understand the central bank's policy decision pattern, changes in the monetary policy interest rate will be widely expected and already priced into the market before the actual change in the money market interest rate takes place. If the market rate changes after a Bank Board meeting, this means that the decision was different from what economic agents had expected and this decision had not been fully priced in the market rate. We use a very simple indicator of the predictability of monetary policy suggested by Bernhardsen and Kloster (2002). The approach rests in examining the differences between the one-month money market interest rate (1M PRIBOR) the day after the Bank Board's meeting and the day before it. We choose the one-month rate since shorter rates are

FIGURE 5 Change in One-month Money Market Rate (1M PRIBOR) Following Bank Board Meeting (in p. p.)



under strong influence of the daily repo operations of the central bank and are thus not a sensible measure of market expectations. The differences approximate the ratio of “surprise” of the agents. For example, if the value of the “surprise” is  $-0.25$  p. p., this means that economic agents expected a higher monetary policy rate by  $0.25$  p. p.

The results are depicted in *Figure 5*. They point to a systematic bias in expectations; specifically, economic agents have systematically expected higher monetary policy interest rates than they turned out to be in reality. One could speculate that this bias is a consequence of more backward-looking expectations of financial market participants than of the CNB. Specifically, if the CNB is more forward-looking than the rest of the agents in the economy (which is often assumed in macroeconomic models), then in disinflations it will loosen its policy stance faster than generally expected. Nevertheless, the “surprises” have been declining since the beginning of the Inflation Targeting period, which suggests a gradual improvement in the transparency of CNB’s monetary policy decision-making.<sup>14</sup> Recently the trend is not so clear as several policy decisions during 2002 were either not anticipated (April 2002) or the change of the interest rates was expected to be smaller (July 2002).

To summarise this section, it seems that the expectations of economic agents on future inflation in both the one-year and three-year-ahead horizons are remarkably stable which suggests a belief in the stabilising properties of monetary policy. The long-term inflation targets seem credible but the decisions leading to fulfilling the targets are not well expected in advance which suggests there is still some scope to enhance the predictability, transparency and communication of the CNB.<sup>15</sup>

<sup>14</sup> One of the referees suggested this improvement in predictability could be connected to the fact that the frequency of interest rate changes went down and the rates even stayed stable in 2000. However, we interpret the decision not-to-change rates just as important as changing rates. The effect on expectations may be very similar – see December 2002 when market expected a rate cut but the rates stayed stable. The relative stability of our indicator in 2000–2001 could rather be connected to lower occurrence of shocks that monetary policy would like to respond to. More detailed analysis would be needed to prove this.

## 2.3 The Loss Function Approach

Another way to evaluate the performance of monetary policy is through the “loss function approach”. The loss function mathematically captures the preferences of agents that minimise fluctuations – losses – of the relevant variables around their desired levels. These are generally long run equilibrium values of the variables. General additive separable loss function is (1) where value of losses ( $L$ ) is given by the sum of weighted squared deviations of the  $k$  relevant variables from the target values. Bigger values of the losses are connected with less utility.

$$L_t = \sum_{i=1}^k \text{weight}_i \cdot (\text{variable}_{t,i} - \text{target}_{t,i})^2 \quad (1)$$

It would be useful to inspect the social loss function while examining the impact of monetary policy on the utility of economic agents. Since this is difficult to construct, we instead suppose the agents in the economy delegate monetary policy and the connected preferences to an independent central bank (CB) and we therefore inspect the CB’s loss function. In the case of the CNB, the delegating was done through the Act on the CNB (no. 6/1993 Coll.). According to Article 2 of the Act, the primary aim of the CNB is price stability and “if this primary aim is not threatened then the CNB should support the general economic policies of the Government leading to sustainable economic growth”. Thus the Act explicitly sets two of CB’s preferences: price stability and sustainable economic growth.

As was already mentioned, the price stability goal has been in effect only since May 2002; up to May 2002 the main aim was monetary stability. However, we believe price stability well approximates the main aim for the whole time period.<sup>16</sup> For this reason we will measure price stability by squared deviations of inflation from the targeted inflation. In transition countries the rate of inflation, considered to represent price stability, is higher than in the developed countries due to distorted relative prices that imply a certain price adjustment process. These distortions are partly eliminated through spontaneous price movements and partly through deregulations. These are, however, rather discrete events. They are manifested through big jumps in the overall inflation rate. CB would not react to

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<sup>15</sup> The quality of CNB’s publications on monetary policy – an important element of transparency – was recently noted in a comprehensive study by Fracasso, Genberg and Wyplosz (2003) that evaluates Inflation Reports of 20 IT central banks. The Bank of England’s report is considered the best while the CNB ranks sixth in the survey – better than such experienced inflation targeters as Sweden, Australia and Canada.

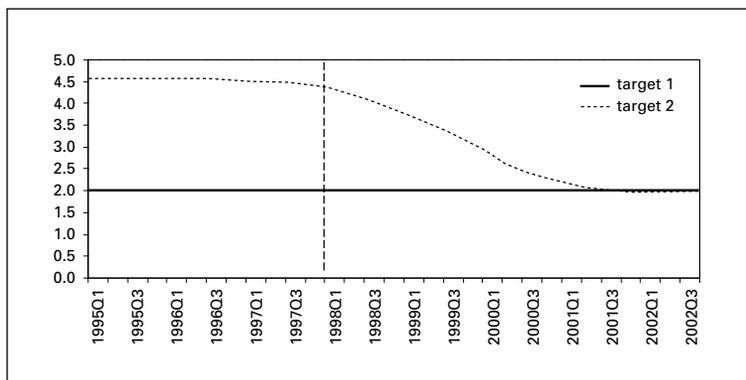
<sup>16</sup> Monetary stability covers the internal part and the external part – price stability and exchange rate stability. Although up to the end of May 1997 the CNB had pegged the exchange rate and afterwards changed the exchange rate regime to floating, we assume the CNB did not change its preferences but only the way to achieve them. The exchange rate peg was justified to import low foreign inflation, to decrease inflation expectations and thus inflation to a desired low level. Therefore exchange rate stability is very firmly connected with price stability.

these deregulations' induced jumps and therefore it is better not to take them into account during the analysis of the performance of monetary policy. We remove these influences and use net inflation. We also experimented with narrower price indices (core inflation and core inflation excluding oil prices) but as the results did not differ significantly, we do not report them here.

There are basically two possibilities of setting the level of price stability in this exercise. First, one can focus on the steady state and ask how high an inflation would correspond to the steady state. In the *CNB's Monetary Strategy* (CNB, 1999a) the long run price stability is defined as 2 percent  $\pm$  1 p. p. for net inflation. Second, one can concentrate on the disinflation path from high inflation to the steady-state inflation. This can again be done in two ways. One is to work with the announced inflation targets that describe the disinflation path chosen *ex ante*. This is the approach we took in the first part of this chapter while comparing actual inflation with the inflation targets. Another way to define the disinflation path is to take an explicitly *ex post* approach in which the disinflation path leading to a series of "ex post targets" is a function of equilibrium real exchange rate appreciation.

Specifically, we suppose an equilibrium process of real exchange rate appreciation (which arises from the Balassa-Samuelsson effect, adjustment of terms of trade and price deregulations) may be realised through two channels: nominal exchange rate appreciation and/or positive inflation differential. Up to May 1997 the exchange rate was pegged and therefore the equilibrium exchange rate appreciation had to manifest itself only through higher inflation. However, after abandoning the peg and switching to IT, the relative price adjustments between tradables and nontradables could also "leak" through nominal exchange rate appreciation. Therefore we use the definition of real exchange rate appreciation (positive values mean depreciation,  $\Delta RER = \Delta ER + \pi^{GER} - \pi^{CZ}$ ) to derive a series of "ex post (net) inflation targets". We estimate the path of the equilibrium real exchange rate appreciation by a Kalman filtering technique (average appreciation is around 5.3 percent) and set the German equilibrium inflation to 1.5 percent, which is broadly in line with the actual developments and the ECB's target. Nominal exchange rate appreciation up to 1997Q2 reflects the fixed exchange rate regime and is set to zero. After this period we take the actual nominal appreciation and use a Hodrick-Prescott filter to extract a trend. We assume that the long-term trend in the nominal exchange appreciation is a good approximation for implicit equilibrium nominal exchange rate appreciation. This assumption is the main drawback of this approach, because it assumes that the trend in the nominal exchange rate appreciation is exogenous (from the view of setting the inflation target). After this initial step, we subtract the gradually decreasing contribution of regulated prices (from 3 p. p. to 1 p. p.) to obtain the "ex post targets" for net inflation. These gradually decrease from 4.5 percent in 1995 to the 2 percent steady state in late 2001. *Figure 6* compares these two definitions of the inflation target used in the loss function analysis below.<sup>17</sup>

FIGURE 6 Two Definitions of the Inflation “Target”



The second aim of the central bank – sustainable economic growth – is often defined in terms of stable growth. The reason is that fluctuations of GDP lead to a worse allocation of resources, which leads to a smaller attainable level of GDP. In other words, this aim is approximated by a zero output gap in the CB’s loss function as a policy goal.

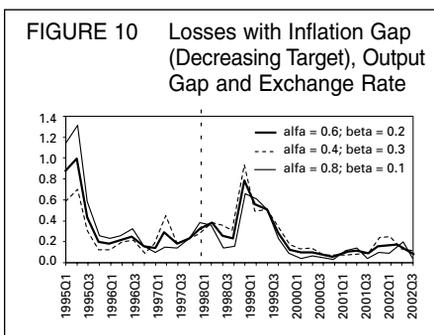
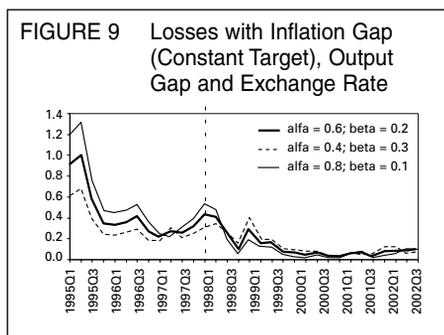
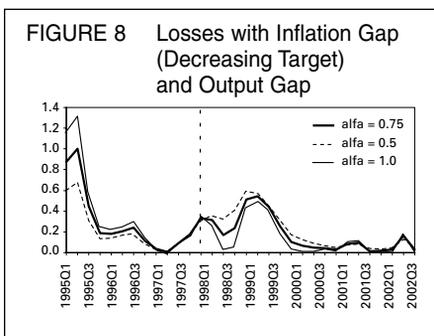
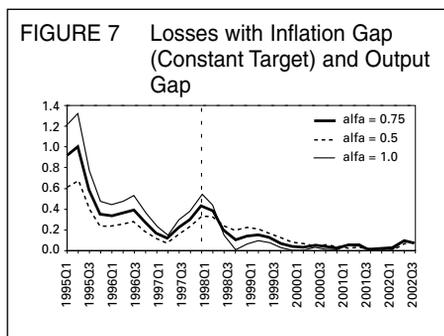
Now we can derive a specification of the loss function (2). The important task is to set weights to mirror the supposed preferences for stable prices vis-à-vis stable growth. Because of lack of data we cannot estimate weights in the loss function directly. Instead, we use the estimates by Cecchetti and Ehrmann (1999) who specified the average weight on the inflation gap to 0.75 for IT countries. Therefore we set the weight  $\alpha$  (weight on the inflation gap) to 0.75 as a baseline in equation (2). This implies a 0.25 (1–0.75) weight on output gap, and the inflation gap-output gap ratio is 3:1. Because of uncertainty we test another two calibrations, in which we let  $\alpha$  equal 0.5 (same weights on inflation and output) and 1.0 (strict inflation targeting).

$$L_t = \alpha \cdot (\pi_t - \pi_t^T)^2 + (1 - \alpha) \cdot (y_t - y_t^*)^2 \quad (2)$$

Further, we test for the inclusion of the exchange rate in the loss function. First, this could follow from the CB’s pursuit of low exchange rate volatility in order to minimise the possibility of an exchange rate crisis and bubbles. Second, the important role of the exchange rate in the policy decision making of the CNB is suggested by Červenka and Navrátil (2003).<sup>18</sup> Moreover, the concerns about exchange rate volatility are also clearly detectable from reading the Minutes of the Board meetings of the CNB. We

<sup>17</sup> Note that these artificial “*ex post* targets” reflect the actual nominal exchange rate appreciation. This is the main reason they are about 2 p. p. smaller than the CNB’s actual targets for net inflation (see Table 1). Further, note that the artificial target path decreases over time, just like the actual target path. Since current estimates show that the rate of real exchange rate appreciation decreased only very gradually, this means that the rate of nominal exchange rate appreciation was to rise in order to meet both the actual and, of course, these artificial targets.

<sup>18</sup>Sutherland (2001) or Batini et al. (2001) offer a discussion of the exchange rate treatment within a central bank’s loss function.



therefore test the robustness of our results by including the rate of change of the nominal exchange rate in the loss functions through specification (3), in which we set the weights of  $\alpha$  to 0.6 and of  $\beta$  to 0.2. We also present two other calibrations:  $\alpha$  to 0.4 and 0.8,  $\beta$  to 0.3 and 0.1 for sensitivity analysis.

$$L_t = \alpha \cdot (\pi_t - \pi_t^T)^2 + \beta \cdot (y_t - y_t^*)^2 + (1 - \alpha - \beta) \cdot (\Delta er_t)^2 \quad (3)$$

Next we proceed with calculating the loss functions using quarterly data for 1995Q1–2002Q4. We examine four specifications – two with a constant inflation target and two with a decreasing inflation target (see Figure 6). Under both types of targets we test for including the exchange rate in the loss function. The results are normalised so that the highest value of baseline case is equal to one and are depicted in *Figures 7 to 10*. The general outcome is that after introduction of the IT regime in the Czech Republic the average losses have gradually decreased to a lower level compared to the pre-inflation targeting period. In 1998 and 1999 there was an increase in the values. This was connected with exogenous shocks, which were under the institute of escape clauses, and partly with the opportunistic disinflation described in the first part of this chapter. However, after these shocks the losses decreased to a relatively lower levels. The average values of losses in the inflation targeting period in comparison to the pre-inflation targeting period are smaller by 75 percent in the case of

the “constant target” specifications and by 35 percent in the “decreasing target” specifications. The differences are relatively large but the result that inflation targeting is connected with lower losses seems quite robust.

### 3. Summary and a Look Ahead

The Czech National Bank introduced Inflation Targeting as a tool to stabilise the economy in late 1997. It was directed at short-term stabilisation after the exchange rate turmoil in 1997 but more importantly at stabilising the price level in the medium-term. The rate of inflation fell from an average of 11.8 percent in the period of combined monetary and fixed exchange rate targeting (1993–1997) to 4.7 percent during the Inflation Targeting period (1998–2002). While external shocks played an important role, our analysis shows that the strategy has significantly contributed to maintaining stable inflation environment.

We show that the regime design evolved over time from a rather specific setting towards a framework based on international best practices. The distinct features of the regime introduced at the beginning of the regime – as were the short-term targets defined as a December-to-December change in prices in terms of net inflation – were abandoned as the framework evolved and were replaced with a more standard set-up. This, however, is not to say that the specific features were a step in the wrong direction – they simply fulfilled their role in the specific environment. Nevertheless, the move towards a smoothly declining target corridor from the year-end targets made the Czech IT regime more transparent. At the same time, the CNB abandoned the net inflation index and started to target the headline inflation. This reflected the choice to manage the difficult issue of communicating reactions to supply shocks through the so-called escape clauses rather than through a narrower inflation index.

The changes in the regime must, however, be analysed from the point of view of the final objectives of monetary policy. It would be no good to have a regime with “best-practice” design if the final aims of monetary policy were not attained. Evaluating the performance of monetary policy is a challenging task. We offer three methods, explain why they could be suitable and attempt an evaluation. First, we look at the crudest of the methods – a comparison of inflation and the inflation targets. The inflation rate in the Czech Republic stayed below the targeted rate of inflation for most of the period under discussion. We ask what the causes were and develop a framework that distinguishes among four possible reasons for missing the target. We argue that external disinflation played a crucial role in the past development of inflation. Second, it is argued that since the goal of monetary policy in the end is to facilitate efficient decisions of economic agents, one could attempt to evaluate monetary policy by examining whether it has led to a more stable decision-making environment. In this context we analyse the developments of inflation expectations and policy moves expectations. We show that inflation expectations have been re-

markedly stable and resistant to one-time swings in the inflation rate. The long-term inflation expectations moved closer to the long-term target over time, which is interpreted as a gradual increase in the credibility of the CNB's monetary policy targets. To further scrutinise the stabilising impact of monetary policy on the decision-making of economic agents, we examine to what extent the policy moves of the CNB have been anticipated in advance. The more policy changes are anticipated, the more transparent the policy is. We conclude that after the initial period, the CNB's interest rate moves became more anticipated. This positive process, however, seems to have been partially disrupted during 2002. Finally, the last approach we suggest for evaluating the performance of monetary policy is the standard exercise of the impact of monetary policy on the variability of prices, inflation and the output gap. We offer an approach in which the variability of inflation and the output gap are examined in the same time and label the approach as a "loss function approach". Under this approach, it is essential how one defines the mean value of inflation. We offer two solutions – one of stable inflation at the level of price stability and the other with a decreasing inflation mean. Using this approach, we conclude that the period of Inflation Targeting is connected with a smaller value of overall losses and further argue that the losses themselves decreased during the Inflation Targeting period.

Overall, it seems that the Inflation Targeting regime has contributed to higher macroeconomic stability of the Czech economy. In the future the CNB could consider having its regime and internal procedures evaluated by an external body or economist as the Reserve Bank of New Zealand (Svensson, 2001), the Bank of England (Pagan, 2002) or the Norges Bank (Svensson et al., 2002) have done. The outlook to the future of Czech monetary policy is no doubt connected with the integration of the Czech Republic into the EU and later the EMU. Joining the EU in 2004 will most likely not have a significant impact on the way Czech monetary policy is conducted as the euro will be adopted only after the CR becomes part of the Eurosystem. The exchange rate policy in the EU will become a matter of "common concern" in the ESCB but this should not critically influence the way the CNB conducts its managed floating regime under Inflation Targeting. The current inflation target is defined until the end of 2005 and preparations and background studies are now under way for setting the new inflation target. The target may be decreasing or it may be constant, it may be defined as a point target or follow past practice as an interval target. Whatever the final choice, the target for 2006 and beyond should be announced no later than in April 2004.

The biggest challenge for Czech monetary policy in the future will be, however, connected with the hand-over of its sovereignty to the ECB. The CNB released its "euro strategy" in December 2002 to start up a general discussion with the public and the government (see (CNB, 2002)). In the meantime, Inflation Targeting is viewed as a useful strategy to stabilise the economy and the compulsory participation in the ERMII is regarded merely as the gateway into the eurozone. In the future, the CNB should be ready to contribute to the common monetary policy of the eurozone with its experience in the field of Inflation Targeting.

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## SUMMARY

JEL Classification: E50, E52

Keywords: inflation targeting – measuring performance of monetary policy

# **Inflation Targeting as a Stabilization Tool: Its Design and Performance in the Czech Republic**

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The article focuses on the development and performance of inflation targeting in the Czech Republic. It is shown that the particulars of the Czech inflation-targeting regime developed from a rather specific setting toward a framework based on international best practices. Its performance is evaluated using three methods. The results suggest that even though inflation targets have been missed more often than met, the practice of inflation targeting has significantly contributed to the stabilization of the Czech economy.