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Foreign Exchange Interventions Under Inflation Targeting: The Czech Experience

Tomáš Holub *

Abstract

This paper discusses the role of foreign exchange interventions in the inflation-targeting regime, focusing on the Czech experience since 1998. It proposes criteria for assessing whether the interventions are consistent with the inflation targeting. While the CNB's interventions in mid-1998 and in 2002 pass these criteria easily, the judgement might be more uncertain concerning the interventions in early-1998 and in 1999/2000. It is also stressed that the literature on managed floating usually ignores the difficulty in defining clear procedural rules for the interventions. This contrasts with the procedures guiding the interest rate decisions under the inflation targeting regime, which may occasionally create tensions in the policy regime, as demonstrated by the Czech experience, too. The interventions' effectiveness in the Czech Republic is also discussed. It seems that sometimes they might have had an immediate impact lasting up to 2 or 3 months, but no strategy can be identified that would work in all episodes. Moreover, even many of the "successful" interventions were not able to prevent quite prolonged periods of exchange rate overvaluation in 1998 and in 2002. It is concluded that the signalling role of foreign exchange interventions is more important than their "market-equilibrating effect", implying a rather unstable transmission between the central bank actions and the market reactions. Finally, the paper analyses the sterilisation costs, which are shown to have been quite substantial in the Czech Republic. It is argued that the financial sustainability of the interventions is quite important for their credibility and effectiveness.

JEL Codes: E42, E44, E52, E58, E65, F31.
Keywords: Exchange rate, foreign exchange interventions, inflation targeting, sterilisation.

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1. Introduction

This paper discusses the role of foreign exchange interventions in the inflation-targeting regime, focusing on the Czech experience since 1998. It does not aim to provide an exhaustive analysis using econometric techniques, but rather to summarise the major stylised facts. This may be useful on several grounds. First, the Czech National Bank's (CNB's) approach to managing the exchange rate float as part of the inflation targeting framework has gone through a process of evolution. It is thus important to ask where it stands at present, and what the policy recommendations should be if the CNB was supposed to face another period of exchange rate volatility in the future. Second, summarising the stylised facts may be a useful first step towards further research, including an econometric one. Third, the Czech experience may contribute as an important case study to the growing international literature on managed floating, and in particular its combining with the inflation targeting framework. The operational issues of the foreign exchange interventions are an important aspect of this debate. Finally, there may also be some lessons for the future membership of the Czech Republic in the ERM II regime, in which foreign exchange interventions will gain on importance among the CNB's policy instruments. I do not, however, deal with this last issue directly in this paper, as I focus on combining the inflation targeting with managed floating, and the ERM II participation will mean a shift away from this regime.

I discuss the direct interventions only. It must be noted that verbal interventions are also used frequently by many central banks including the CNB to influence the exchange rates. I believe that the verbal interventions should follow broadly similar principles that I propose in this paper for assessing the appropriateness within the policy regime for the direct interventions. There is one natural difference, of course, in terms of communication openness, as the verbal interventions are by definition public and fairly transparent (at least provided that the "do-not-lie" principle is observed), while the direct interventions might be more secretive (see below).

The paper is organised as follows. After a brief theoretical introduction in section 2, the current monetary policy framework of the Czech National Bank (CNB) is described in section 3. In particular, I describe the circumstances under which the inflation targeting was introduced after an enforced floating of the exchange rate in May 1997, and what evolutionary changes it has gone through since then. Section 4 focuses on a specific aspect of the regime, i.e. the CNB's foreign exchange interventions, their consistency with the inflation targeting, effectiveness and costs, communication of the exchange rate issues, etc. Section 5 summarises and concludes.

2. Some Theoretical Background

In the past, exchange rate pegs used to be very popular as the operating regime of monetary policy. This automatically meant an important role for foreign exchange interventions among the instruments of central banks pursuing exchange rate pegs. A bit more controversial was the use of foreign exchange interventions among the major floating currencies. These interventions were sometimes carried out, occasionally even in a co-ordinated manner (such as in 1985), but the theoretical and empirical arguments on their desirability and effectiveness have been inconclusive (see Sarno and Taylor, 2001; Schwartz, 2000). The only mainstream consensus that emerged, and

has in fact survived since that period, is that non-sterilised interventions are more effective then the sterilised ones, if the latter can achieve anything at all (see Rogoff, 1984; Schwartz, 2000).[1] This belief is linked to the "impossible trinity" hypothesis, according to which the monetary policy cannot simultaneously follow an internal and external policy target under free capital mobility (Flemming, 1962; Mundell, 1963; Summers, 1999).

The traditional arguments in favour of the sterilised interventions' effectiveness have included the signalling channel (Mussa, 1981) and portfolio-balance channel (see Branson, 1976; Kouri, 1976; Edison, 1993), but most empirical analysis that were carried out during the 1980s did not support the quantitative importance of these channels. There are some more recent econometric studies, though, which benefited from better data availability since the 1990s, supporting the effectiveness of the traditional channels of sterilised interventions (see Dominguez and Frankel, 1993; Kearns and Rigobon, 2002). On the theoretical front, the case for sterilised interventions has been also strengthened by the order-flow ("market microstructure") channel (see Lyons, 1997; Peires, 1997; Popper and Montgomery, 2001), which has become very influential in the theoretical debates of the short-and-medium run exchange rate developments. Finally, some authors have argued that the interventions' effectiveness may be greater in the developing and transition economies compared with the advanced countries whose data have been typically used in the empirical analyses (Canales-Kriljenko, 2003).[2]

In any case, it is apparent that the ongoing liberalisation of capital flows and numerous currency crises during the 1990s have changed the world's map in terms of the exchange rate regimes. Most importantly, they have led to a more cautious approach to fixed exchange rates. The "bipolar view" has emerged in the economic literature as the mainstream opinion on exchange rate regimes.[3] According to this view, central banks should either adopt hard pegs, i.e. make the fixed exchange rate regimes extremely credible, or avoid using fixed exchange rates at all and aim for exchange rate flexibility. The soft pegs are now typically viewed as the undesirable, dangerous middle that is inherently prone to crises. This theoretical argument has been reflected in the reality of the last decade, as Figure 1 illustrates (see Fischer, 2001). While many countries have recently moved to floating exchange rates, some other economies have adopted currency boards, dollarized/euroized their economies, or formed monetary unions. On the contrary, the number of countries with intermediate exchange rate regimes ("soft pegs") has declined significantly.

Among the hard pegs, foreign exchange interventions are necessary only under currency boards (and the de facto hard pegs which formally belong to the soft peg group), as unilateral dollarisation/euroisation and currency unions mean elimination of the national currency. A key characteristic of currency boards is that the interventions are automatic, unlimited and non-sterilised, i.e. the countries with this policy regime give up their monetary policy autonomy completely. The role of interventions under hard pegs is thus clear, and I will not discuss it in this paper.

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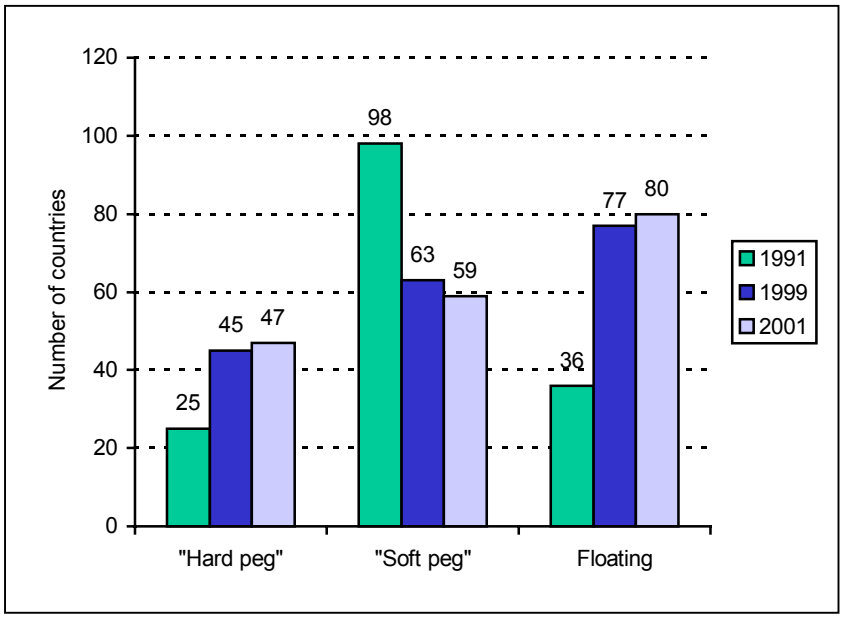
[1] The distinction between sterilised vs. non-sterilised interventions is a blurred one, in my opinion. It relies on the assumption that the central bank uses the monetary base as its operating target. This assumption used to be quite popular in the earlier literature, but is not in line with the operating regimes of monetary policy that are used in the actual practice, in which the central banks control short-term interest rates (see e.g. Romer, 2000).

[2] For a more comprehensive survey of the literature see Frait (1997) and Geršl (2003).

[3] Although a mainstream view, it is by far not consensual. Williamson (2000) is one of the examples arguing in favour of the intermediate options (the so-called "basket, band and crawl" system).

Figure 1: The "Bipolar" View in Practice



Source: *IMF; Fischer (2001).*

Within the group of those countries that choose, for one reason or another, to implement an independent monetary policy with a large degree of exchange rate flexibility, there is a relatively high degree of heterogeneity. The floating may be pure or managed to some degree, including a very tight management. Moreover, the de facto practice often differs from the declared exchange rate strategy, typically in the direction of tighter actual practice compared with the de jure regime (see Calvo and Reinhart, 2000; Bofinger and Wollmershaeuser, 2001 for attempts to classify the degree of exchange rate management empirically). The interventions thus still belong to the real life, and the "fall of foreign exchange market intervention as a policy tool" suggested by Schwartz (2000) might be a pre-mature conclusion.

The countries with flexible exchange rates also differ in the nominal anchors they are using for their economies. There are basically three options. Firstly, the central bank can follow a pragmatic "just-do-it policy without any explicit nominal anchor, but with a long-run price stability objective (possibly combined with other short-term objectives) clearly in mind. Secondly, a strategy of money targeting can be implemented, relying on some measure of the money supply as an intermediate target. Thirdly, the inflation targeting can be adopted, under which the central bank focuses directly on inflation, or more precisely on its forecast (see Svensson, 1997). In the competition among these approaches, the inflation targeting has been increasing its "market share" since the 1990s. As reported by Mahadeva and Stern (2000), 54 countries in the world had an explicit inflation target in 1998, of which 11 had it as a sole policy goal. And since then, many other countries have joined the club, or have been thinking about that possibility seriously (see e.g. Truman, 2003).

When implementing the inflation-targeting regime, however, a country has to solve many practical problems to design a system that fits both the theoretical wisdom and the particular circumstances of each economy. Among other things, a crucial question is what approach should the central bank use to deal with possibly large exchange rate fluctuations. This question has

become more topical in recent years, as the inflation targeting has spread to small open economies, which are very vulnerable to exchange rate shocks and may thus exhibit a "fear of floating" (Calvo, Reinhart, 2000; Carare, et al., 2002). Moreover, many of these countries are emerging markets or transition economies that are typically subjected to the volatility of international financial flows, and the exchange rate turbulences might be therefore more likely or severe in their case compared with advanced market economies. We may thus ask to what extent should a central bank pursuing the inflation targeting use foreign exchange interventions as its monetary policy tool, i.e. whether it should let the exchange rate float freely or if it should try to manage the float to some extent.

The theory of inflation targeting (see e.g. Svensson, 1998; 1999) gives – in many cases implicitly rather than explicitly – quite a clear answer. In most models, it is assumed that the exchange rate behaves according to the uncovered interest rate parity (UIP). In other words, it is assumed that perfect arbitrage exists in the liberalised foreign exchange markets. The elasticity of short-term capital flows to yield differentials is believed to be infinitely high. There is thus no use trying to influence the supply or demand of foreign exchange, because all central bank's interventions would be countervailed by an equally strong flow of private capital in the opposite direction. On the other hand, interest rate changes should be very effective in influencing the exchange rate.

In this context, we should also understand the earlier debates on sterilised vs. non-sterilised interventions. The modern operating regime of most central banks relies on controlling short term-interest rates as the major policy instrument, rather than controlling the monetary base. The volume of domestic money market operations (i.e. the volume of sterilisation) adjusts accordingly. This means that any foreign exchange intervention is in fact sterilised almost automatically. Only when the intervention is accompanied with a change in the official interest rates, is the mechanism that was used in the earlier literature to explain the effectiveness of non-sterilised interventions allowed to work. But to deliver a reduction in the interest rates, the central bank needs not carry out foreign exchange interventions, it can simply announce a change in its major tool – the short-term interest rate. If it does this, the exchange rate will be affected in line with the UIP; but this can hardly be called effectiveness of non-sterilised interventions. The interventions have no value added as a policy tool.

If one wanted to be less strict, it is possible to argue that even with the UIP the central bank might be able to affect the current exchange rate with foreign exchange interventions by changing the market expectations about the future exchange rate path, or by influencing the risk premium. If a central bank is credible, its foreign exchange interventions may signal to the market that the current exchange rate is far from the equilibrium, which will require future realignment, and this may change the market expectations. The interventions may also signal the need of future interest rate changes, influencing the expected yields on the domestic currency (see Mussa, 1981; Dominguez and Frankel, 1993). At the same time, by causing short-run losses to speculators, the central bank might influence their perception of risk in the foreign exchange market. If we subscribe to this theoretical point of view, the effectiveness of the interventions is likely to depend on their credibility and signalling power, rather than on their volume.[4] The transmission

[4] The credibility may, however, be linked to the interventions' volume. Mussa (1981), for example, has emphasised that by opening its foreign exchange position, the central bank faces future losses if its interventions fail. Current interventions thus may serve as a commitment device to defending the exchange rate using all the central bank's instruments, thus changing the market's expectations about future monetary policy.

mechanism between interventions and the exchange rate is likely to be very uncertain and unstable in such a world, implying a great difficulty in using the interventions as a systematic monetary policy tool. Moreover, it is not clear, whether the same signal cannot be sent by the central bank in another way, which would be more consistent with the inflation targeting framework (see Svensson, 2001).

The theory of inflation targeting thus typically assumes, or even recommends, a purely floating exchange rate. The only instrument that the central bank then has is its short-term interest rate. To the extent that the exchange rate fluctuations influence the targeted inflation rate and the output gap, interest rates are used to respond to the exchange rate shocks. Their changes are transmitted to the economy both through the interest rate channel and through the UIP, i.e. the exchange rate channel. The literature then elaborates on such issues as whether the central bank should target the overall CPI, some domestic price index (see e.g. Svensson, 1998) or "long-run inflation" only (see Ball, 1999); how intensively to use the direct price channel of exchange rate transmission; whether to rely on a monetary condition index as an operational guide for interest rate decisions or not (see e.g. Ball, 1999; Čihák and Holub, 2000; Svensson, 2001); whether to include the exchange rate into the reaction function, etc.

Some more recent literature, however, has started to argue in favour of managing the floating exchange rate as part of the inflation targeting regime (see e.g. Bofinger and Wollmershaeuser, 2001, 2002; Goldstein, 2002; Truman, 2003).[5] In this "third-way" approach, the demand and supply in the foreign exchange market are typically viewed as downward and upward sloping, respectively, relying on the order-flow approach or portfolio balance effect (see above). By carrying out foreign exchange interventions of an "appropriate" volume, the central bank should be able to achieve its foreign exchange target. The interventions can be effective even if they are relatively small in comparison with the international financial markets' turnover, as they can generate a "hot potato effect" (Lyons, 1997; Bofinger, 2000) leading to many subsequent trades.

Which of the two alternative views is correct is still an open issue that will require further research and empirical testing. It is a matter of fact, though, that some of the inflation-targeting countries use foreign exchange interventions more or less frequently. The Czech Republic belongs to such cases. It is also true that in spite of some recent attempts (see Canales-Kriljenko, et al., 2003), generally recognised best practices on the operational issues are missing for such policies, which may often create challenges for the central banks. The aim of this paper is thus to provide a simple case study of the so-far Czech experience, as well as to contribute to the debate on the best intervention practices, focusing specifically on the inflation targeting regime. But before doing so, let me first briefly describe the general characteristics of the Czech monetary policy regime and its evolution over the recent years.

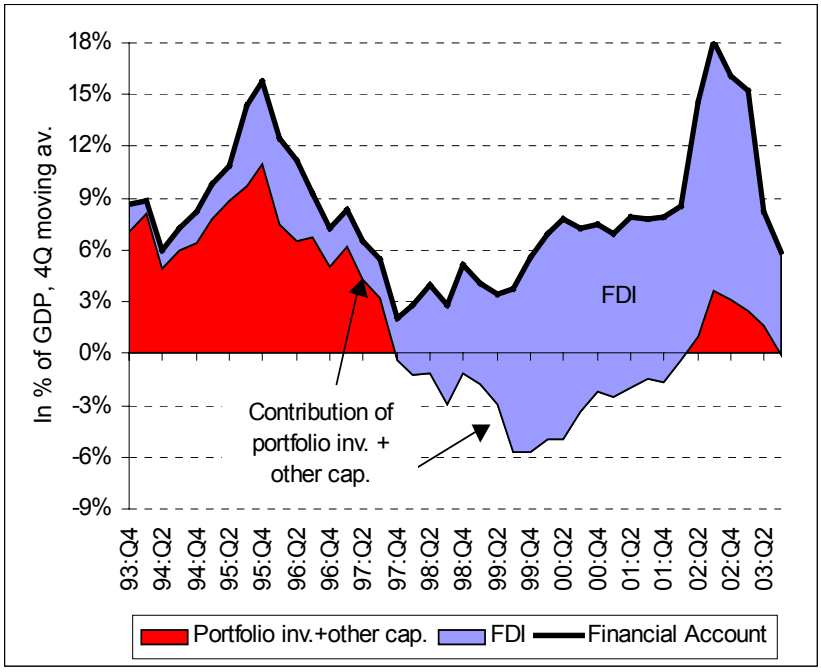
[5] Goldstein (2002), for example, argues in favour of a "managed floating plus" system, in which the managed floating is supplemented with inflation targeting as a nominal anchor and with financial stability policies. In my opinion, it would be better to call this monetary policy regime "inflation targeting plus", because I view the inflation targeting as the principal anchor and the other two aspects as its supplements.

3. The Czech Republic – Historical Background and Policy Regime

The Czech situation has some specific characteristics that are useful to understand before moving to discuss the exchange rate management as part of the inflation targeting framework (see also Hrnčíř and Šmídková, 1998).

First, the inflation-targeting regime was introduced in the Czech Republic in late-1997 after an enforced floating of the exchange rate in May 1997, which ended the period of a fixed exchange rate regime introduced at the beginning of economic transition.[6] At that time, the economy and market expectations were destabilised due to the economic overheating of the mid-1990s, currency depreciation, increased speed of price deregulations in early-1998, pro-cyclical fiscal policies, etc. In contrast to the advanced countries, the inflation targeting regime was designed as a strategy of disinflation – not just maintaining low inflation – after a turbulent period.

Figure 2: Capital Inflows to the Czech Republic



***Source**: IMF; Fischer (2001).*

Second, the Czech Republic was the first transition country to adopt inflation targeting. The range of transition-specific issues includes, among other things, the challenges of the long-run convergence and trend real exchange rate appreciation, sharp volatility of foreign capital flows (both private and due to privatisation revenues; see Figure 2), gradual (but often not smooth) decline in the risk premium over time, etc. These are factors that have influenced the inflationary and exchange rate developments, and thus also central bank policies.

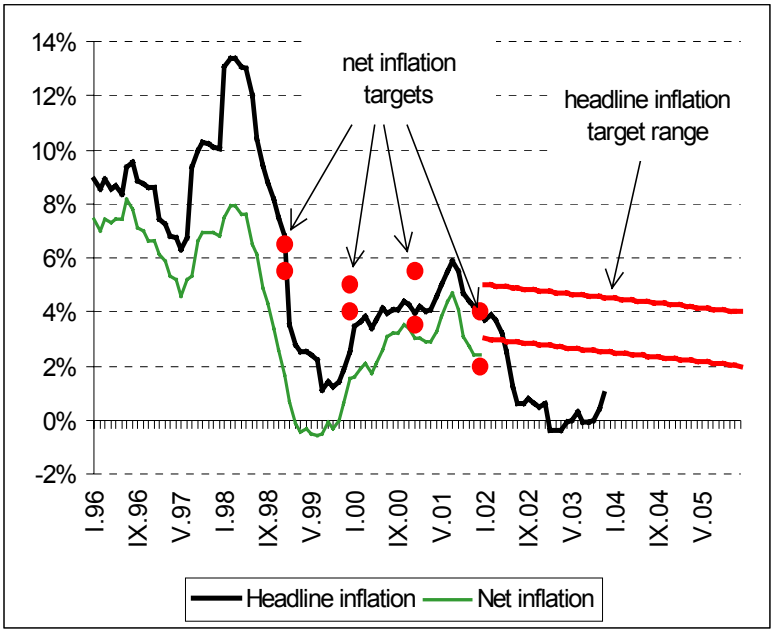
Third, the Czech Republic is a very open economy. This makes it potentially more vulnerable to exogenous and exchange rate shocks. The exports of goods and services equal 65 % of the GDP

[6] The Czech experience thus fits into the global trend of moving from soft pegs to the corner exchange rate regimes as a response to increased capital mobility and currency crises of the 1990s.

(imports are 67 % of GDP), meaning that the demand transmission channel as well as the supply-side channel of the exchange rate are potentially quite significant. At the same time, the share of imported goods in the consumer basket is estimated at around 25 % (see Beneš, et al., 2003), implying a strong direct price channel of exchange rate transmission.

All the above factors contributed to the fact that the CNB's record in terms of hitting the announced inflation targets has been quite poor so far. In particular, the CNB undershot its targets for net inflation in all the first three years from 1998 to 2000 (see Figure 3), hitting the target in December 2001 only. The sharp disinflation in this period was primarily a result of an unexpected decline in food and oil prices during 1998-99, combined with a surprising exchange rate appreciation in 1998 and an economic recession in 1997-98. Similarly, the headline inflation has been below the announced target range since mid-2002, and was in fact slightly negative in the first months of 2003 (see Figure 3). Among the factors that have caused this development, one can point to important exogenous price shocks, but exchange rate appreciation and a negative output gap have played a role in this episode as well.

Figure 3: Czech Inflation: Actual vs. Targets



Source: *Czech Statistical Office.*

On the positive side of the so far experience, the biggest achievement is a stabilisation of inflation expectations at low levels and the credibility of the monetary policy regime, which has been gained despite the frequent target misses. The credibility has been facilitated by a gradual development of the regime (longer-term orientation, switch to headline inflation targeting, better co-operation with the government and so on) in response to the accumulated experience and changing needs. Simultaneously with the whole regime, its communication to the public has been evolving, too. At present, a high degree of transparency has been achieved in monetary policy, but also in other areas of the CNB's activities.

It can thus be summarised that the inflation targeting has so far achieved its major goals – i.e. low inflation expectations, high credibility and transparency – but has got problems with reaching its targets, partly also due to the exchange rate developments.

4. Management of the Exchange Rate

In this section, I will focus on one particular aspect of the Czech inflation targeting-regime, namely exchange rate issues and the approach to managed floating, which has been – as the whole inflation targeting regime of the CNB – evolving over time in response to the emerging challenges. First, I will describe the exchange rate developments and the policy towards their management. Second, I will assess the consistency of foreign exchange interventions with the inflation targeting regime. Third, the procedural consistency and public communication of the interventions will de dealt with. Fourth, I will focus – in a non-formalised way, which should be understood as a first step towards a more thorough analysis in the future – on the effectiveness of intervention policy. Finally, I will discuss the sterilisation costs.

4.1 Exchange Rate Developments and Policy Responses

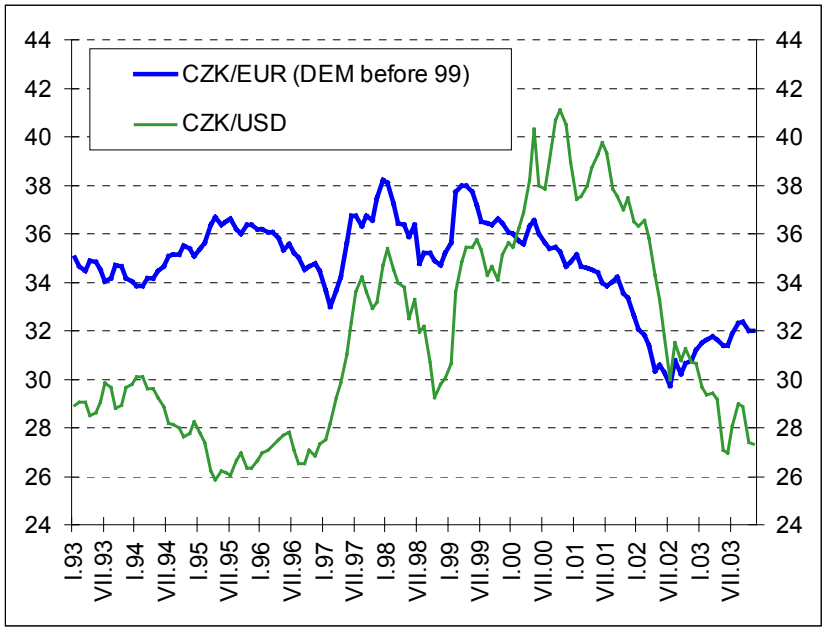
When the floating exchange rate was introduced in May 1997, it was announced that the exchange rate regime would be a managed float, the DEM (EUR at present) serving as a reference currency. The CNB thus retained the possibility to intervene in the foreign exchange market "in the event of excessive volatility or unjustified exchange rate trends".

Figure 4 shows the development of the CZK's exchange rate against the EUR (based on the DEM prior to 1999) and the USD since 1993. Figure 5 demonstrates the development of the nominal and real effective exchange rate.

As Figure 5 shows, the real effective exchange rate has had a long-run appreciating trend (both in CPI and PPI terms), regardless of the exchange rate regime. Before 2001, the appreciation was mainly due to an inflation differential, since then is has gone through strengthening of the nominal exchange rate. The appreciating trend might be explained by a combination of several factors, including the Balassa-Samuelson effect, improving quality of Czech products leading to terms-of-trade gains, deregulations of administered prices, etc. (see e.g. Halpern and Wyplosz, 2001; Čihák and Holub, 2003). It can thus be considered an equilibrium phenomenon unless it exceeds some reasonable speed. This speed is, however, difficult to determine precisely, as only some of its factors can be quantified relatively easily (most analyses focus on the Balassa-Samuelson effect only). The challenge potentially stemming from this real trend is that it may co-ordinate the exchange rate expectations in one direction, i.e. towards appreciation.[7] The price convergence process may also contribute to excess volatility of the exchange rate if the market expectations concerning the long-run trend change substantially over time. The appropriate monetary policy response to such developments is, moreover, difficult to find if the central bank is itself fairly uncertain on what the equilibrium real exchange rate might be.

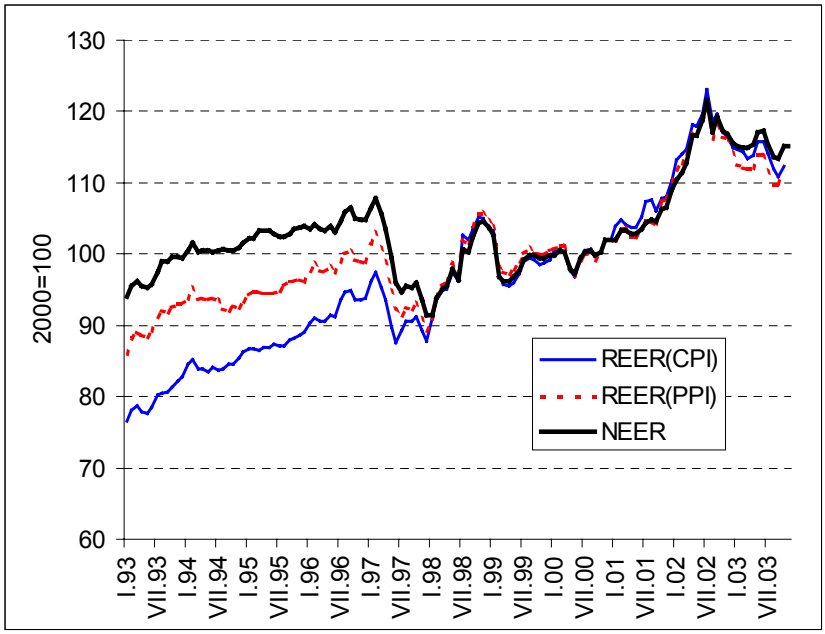
[7] It might thus be one alternative explanation why the interventions have been biased towards purchases of foreign exchange in the Czech case (see below).

Figure 4: CZK's Exchange Rate against the EUR and USD



***Source**: Czech National Bank.*

Figure 5: CZK's Nominal and Real Effective Exchange Rate



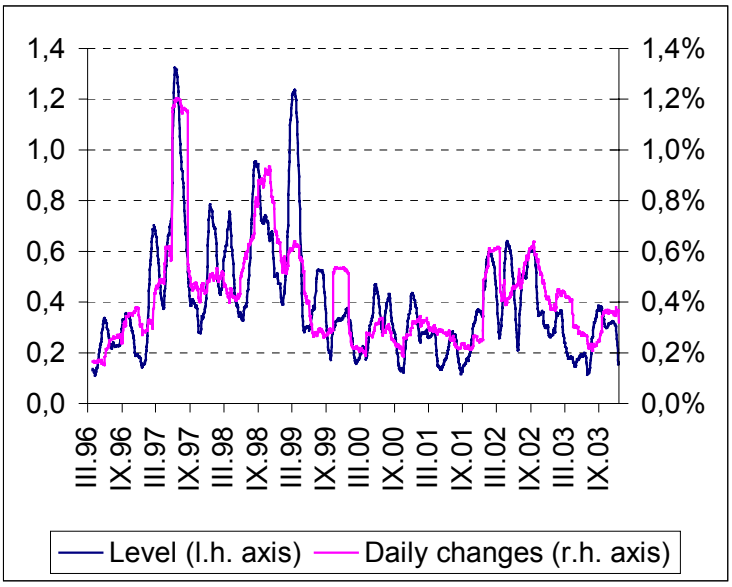
***Source**: Czech National Bank.*

In Figures 4 and 5, it can be also seen that the medium-term volatility of both the nominal and real exchange rate has increased substantially since the exchange rate's fluctuation band was widened in February 1996, and abolished in May 1997. The CZK has experienced two waves of rather sharp appreciations in recent years, which were only with some time lag followed with depreciations to (or below) the trend level. The first one took place in 1998, when the CZK appreciated above its pre-floating level, in spite of the crises in Russia and Latin America. The second one started in 2001 and lasted till late-2002. Although these two periods were both

affected by other strong external influences, it is probably more than a mere coincidence that both these two cases were marked with sub-trend economic growth and undershooting of the CNB's inflation targets (see section 3).

The short-term volatility is summarised In Figure 6 by a moving 60-day standard deviation of the CZK/EUR exchange rate both in absolute level and daily percentage changes. From this figure, one can see that the short-run volatility of the exchange rate was, of course, greatest in the turbulent year 1997, but was also high throughout 1998 and early 1999. After stabilising at quite modest levels since mid-1999, another increase in the short-term volatility was observed during the appreciation episode of 2002, even though its magnitude remained – perhaps a bit surprisingly – well below the previous peaks.[8]

Figure 6: Volatility of the CZK/EUR Exchange Rate (60-day standard deviation)



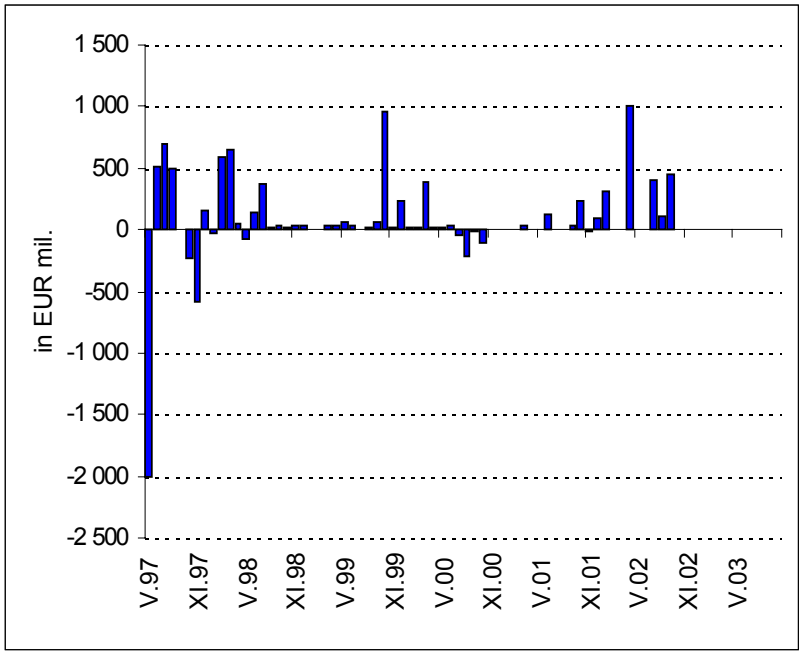
In line with the announced managed floating policy, the CNB has intervened occasionally in the foreign exchange market. With the exception of the turbulent year 1997 (which does not belong to the period of inflation targeting), though, the interventions always concerned purchases of foreign exchange to slow down the exchange rate appreciation (see Figure 7). It might be questioned, of course, if this asymmetry in the interventions does not signal departure from floating exchange rate. For example, Bofinger and Wollmershaeuser (2002) suggest that monotonically growing or falling foreign exchange reserves indicate "that the central bank has tried to influence the trend of the exchange rate (pp. 8)." They in fact argue that this is consistent with "managed floating". But their definition of this term may be different from common understanding (they use the term "independent floating" for a situation in which the central bank leaves the exchange rate determination to the market and intervenes against excessive volatility only). I address this issue in section 4.2.

[8] The short-term volatility of the CZK's exchange rate is analysed econometrically in Bulíř (2003).

The periods of high intervention activity were typically replaced by quite long periods of no interventions. The most active periods were (i) February 1998 - July 1998; (ii) October 1999 - March 2000; and (iii) October 2001 - September 2002. In the first and third case, this coincided with the periods of fast nominal effective exchange rate appreciation, which peaked above 15 % year-on-year. It also coincided with periods of relatively high short-term volatility of the exchange rate. In the second case, the CZK appreciated against the EUR, but it depreciated quite strongly against the USD at the same time due to the EUR/USD exchange rate developments (see Figure 4). As a result, there was no strong nominal effective exchange rate appreciation (Figure 5). This might be interpreted as an indirect 'confirmation' of the euro's reference-currency role in the Czech managed floating.

Besides the direct interventions in foreign exchange market, the CNB has also adopted other measures responding to the exchange rate developments. A special account for the government's foreign exchange privatisation revenues was established at the CNB in early-2000, which has been intended to reduce the exchange rate impact of large privatisation sales. This step was explained by the fact that massive privatisations represented a one-off influence on the exchange rate driven by the government's actions, which might distort the market equilibrium. From this point of view, it has been regarded by the CNB as justifiable to offset this influence with a co-ordinated non-standard action of the authorities.

Figure 7: The CNB's Foreign Exchange Interventions (spot)



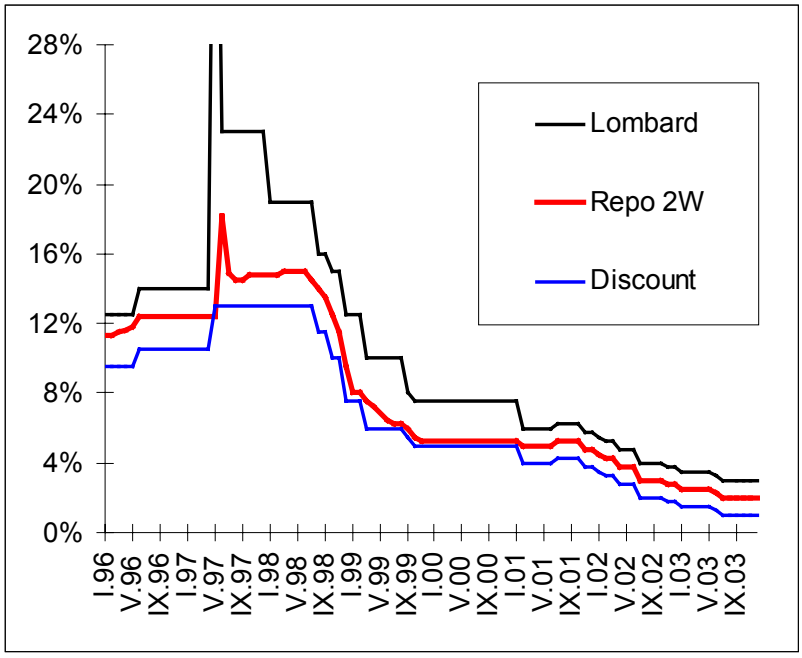
***Source**: Czech National Bank.*

An important aspect of this privatisation account has been the facilitating of communication between the CNB and government on the exchange rate issues and increasing the government's awareness of the exchange rate impacts of their actions. Apart from this positive role, however, the effectiveness of the account was limited till 2001 by the fact that the government never kept its privatisation revenues on the account for long, as it needed the money to improve the weak fiscal situation. Facing the largest privatisation sales to come (electricity, gas, telecommunications

etc.), which were cited by the market participants as the main reason for the exchange rate appreciation, the CNB and the government thus reached an agreement in January 2002. This agreement has kept all of the government's foreign exchange revenues out of the market and at the same time allowed financing the fiscal needs. Direct purchases of the government's foreign exchange revenues by the CNB have been the most important element of the agreement. So far, the CNB has purchased over EUR 4.2 billion from the state. Besides that, a decision was taken to postpone any issues of the government's eurobonds, an aim was intensified to match public foreign exchange revenues and outlays (and to match the foreign exchange assets with liabilities), etc.

It is also important to keep in mind that the interventions can not be viewed in isolation from changes in the main monetary policy instrument, i.e. the short-term interest rates. Figure 8 illustrates their development. It can be seen that with an exception of two minor interest rate hikes (by 0.25 % in March 1998 and July 2001), the Czech nominal interest rates have been on a declining trend since the introduction of inflation targeting. The first period of interest rate cuts started in July 1998 and lasted till late-1999. It thus de facto followed the first wave of foreign exchange interventions (coinciding with it in July 1998 only), and its last stage coincided with the beginning of the second intervention wave. Another period of interest rate cuts started in November 2001 and has de facto continued up to recently, thus coinciding with (and extending beyond) the last episode of intervention activity.

Figure 8: Monetary Policy Interest Rates



Source: *Czech National Bank.*

4.2 Consistency of Foreign Exchange Interventions with Inflation Targeting

The consistency of exchange rate management with the inflation-targeting regime can be assessed on three levels. The first one is the "target consistency". By this I mean whether the exchange rate policy is not in conflict with (or preferably if it is supportive for) achieving the policy goals of inflation targeting. The primary goal should be the inflation target, and without compromising it the central bank may also take into account stabilisation of the real economy if the inflation targeting is interpreted in a flexible manner (which, I believe, is the Czech case). Second, "regime consistency" reflects whether or not the foreign exchange interventions respect the "spirit" of inflation targeting. Third, one may assess "procedural consistency" of the policies. In particular, we may ask if the procedures governing the interventions – such as the decision-making rules, communication to the public, etc. – are consistent with the constraints imposed on the interest rate decision-making under the inflation targeting. In this sub-section, I focus on the first two aspects, leaving the last one to sub-section 4.3.

To start with the target consistency, the logic of inflation targeting requires that the central bank should loosen/tighten the monetary conditions when the inflation forecast is below/above target and/or the output gap is negative/positive. This narrow interpretation of consistency, however, is a very soft criterion.[9] It relates to the overall monetary conditions only, saying nothing about the mix of its two components.

Unfortunately, it is quite difficult to find any harder criterion. Its formulation is not robust against alternative theories of how the exchange rate is determined, as these theories differ in their opinions on the central banks' ability to influence the mix of monetary conditions. On the one hand, if one beliefs that the foreign exchange interventions are completely ineffective, the central bank can influence only the overall monetary conditions, but not their mix, using its only effective instrument, i.e. interest rates. But this case is not very interesting for discussing the consistency of interventions with the inflation targeting. On the other hand, if one believes the interventions to be effective, the central bank has in fact got two instruments. It can then have some additional goal besides the inflation target. In an extreme case, if the foreign exchange interventions were fully effective regardless of the interest rate policy (which is in the older terminology equivalent to perfect effectiveness of the sterilised interventions), central banks would have two completely independent tools. And they could be thus "chasing two rabbits" at the same time.

What could this second rabbit be? First, it could be stabilisation of output. The central bank could use the interventions to reach the inflation target through the direct exchange rate channel, and the interest rates to achieve such overall monetary conditions to smooth out the business cycle.[10] Second, the central bank could try to achieve simultaneously the internal and external balance of the economy (see e.g. Bofinger and Wollmershaeuser, 2002), for example to avoid excessive current account deficits or volatility of the capital flows. Third, the central bank could take into

[9] This does not mean, however, that it is always achieved in practice. As an example, the Hungarian interventions and interest rate cuts in early 2003 can be regarded as target-inconsistent in my opinion, as the inflation forecast was heading above target, requiring a monetary tightening rather than expansion.

[10] Wouldn't it be a wonderful world for an inflation-targeting central bank? The current literature on inflation targeting is concerned with the trade-off between inflation and output stabilisation. A gradual return of inflation to the target is suggested as a solution, various complicating escape clauses are defined. Too aggressive a use of the direct exchange rate channel is discouraged because this could destabilise the real economy (see Svensson, 1998; Ball, 1999).

account financial stability issues, such as elimination of asset price bubbles or dangerous credit booms. All these possibilities would take advantage of the fact that the interest rates and the exchange rate are not perfect substitutes in terms of their impact on the economy (concerning its speed, sector of the economy influenced, impact on the domestic financial markets, etc.).

For example, imagine a situation in which the inflation is below target due to some external price shock, but there is a positive output gap contributing to a high current account deficit and skyrocketing asset prices.[11] Under the standard inflation targeting theory, the central bank would face a tough dilemma whether to cut the interest rates to achieve the inflation target and support the latter negative tendencies, or whether to announce an escape clause and hike the interest rates. But if it could do so, a combination of restrictive interest rates and loose exchange rate might be a much better response. High interest rates would cool down the domestic demand and asset markets while exchange rate depreciation would increase inflation through the direct channel and help to reverse the current account deficit.

Attractive as this may sound, I believe that trying to do this under an inflation targeting regime would be like "praying to Allah in a Christian church" (or to Christ in a mosque). Adopting the inflation targeting in itself reflects certain beliefs concerning the role and possibilities of monetary policy, functioning of the economy, etc. This includes a belief that in the long run, monetary policy can chase one rabbit only, i.e. price stability, and this goal should thus receive priority. It is acknowledged that with liberalised world financial markets the impossible trinity holds, and monetary policy cannot simultaneously control the exchange rate and the domestic monetary policy, at least not systematically so. The foreign exchange interventions thus cannot be considered an independent monetary policy tool (see Canales-Kriljenko, et al., 2003). The determination of the exchange rate is left to the market forces, and central bank interventions – if used at all – should be limited to period of high volatility, serious misalignments and/or disorderly market conditions. High priority is given to transparency and clarity of the decision-making procedures, which means that the decisions should be easily understandable and the individual policy steps should not send confusing signals.

Put all this together, I believe that the regime consistency requires the following: (i) Interest rates are the primary instrument of monetary policy, and should be moved in the direction consistent with the inflation targeting logic, unless a pre-defined escape clause is applied. (ii) Interventions should be used (if at all) as a supplementary tool only, and just in exceptional circumstances. These circumstances include mainly shocks stemming from the foreign exchange market itself, not from other markets. (iii) Foreign exchange interventions should not work in the opposite direction to the interest rate changes.

To make this set of requirements operational, I propose the following set of "almost-necessary" (but not always sufficient) conditions for using the interventions in a target-and-regime consistent manner (using interventions against appreciation as an example, but interventions against depreciation can be treated symmetrically):

[11] Arguably, this might not be a very realistic case, as the external price shock would need to be exceptionally strong to push the inflation below target despite a positive output gap. But extreme examples are often useful to expose a problem.

- Interventions against appreciation are admissible only when the inflation forecast points below target and/or the output gap is negative. In other words, they must be limited to cases when a monetary easing is consistent with the inflation targeting.
- The interest rates should be relaxed and/or declining, reflecting that the primary tool has been used in line with the inflation targeting. The supplementary monetary policy tool (i.e. interventions) should not send confusing signals compared with the main one.
- The exchange rate developments should be viewed as one of the direct causes for target undershooting. This means that the exchange rate should be judged as seriously overvalued in comparison with the fundamentals and the interest rate parity, or moving in that direction quickly. Interventions thus should be considered mostly in those situations in which the mix of monetary conditions includes a loose interest rate component and tight (and/or quickly appreciating) exchange rate component. Such a situation signals that there have been serious disturbances to the functioning of the UIP, and the interventions thus could be considered as an attempt to restore this standard relationship rather than to fight against it. Exceptionally high short-term exchange rate volatility may also be a signal of the UIP's failures.

I do not suggest that these criteria should be adhered to rigidly when deciding on the interventions. First of all, the target consistency might be sometimes difficult to judge. For example, the inflation forecast might sometimes point below the target in the short run, but on-or-above the target in a longer horizon. This kind of dilemma, however, might occasionally emerge even for the interest rates decisions, making the interventions not fundamentally different. The situation might be less clear here, though, due to the different time horizons of the exchange rate and interest rate transmission. It might be then possible to argue that a desirable policy would be to intervene against the national currency and raise the interest rates at the same time, exploiting the different time horizons. Personally, I would be quite cautious in this respect. In most cases, such a policy could be rejected as sending confusing signals, which might have costs in terms of credibility, possibly exceeding the potential benefits of smoothing the inflation rate at the targeted level. Such a policy would also typically mean leaning against the UIP logic, and thus not pass the regime-consistency test. In any case, a more careful analysis would be needed in situations of this kind, and this issue is open for further debate both on practical and theoretical level.

Second, a considerable uncertainty also exists about the equilibrium levels of the exchange rate and interest rates (see also below). It might thus be difficult to judge whether the monetary conditions mix is actually consistent with using the interventions. In practice the rate of change in the exchange rate may thus be more decisive for the policy-making than the exchange rate gap. On the other hand, I think that it is still necessary to discuss the equilibrium levels and produce a benchmark opinion, like it is necessary to produce the benchmark inflation forecast to guide the interest rate decisions, despite the existing fundamental uncertainties. What needs to be added is an assessment of the risks associated with the benchmark opinion, again similar to the interest rate decisions.

Third, there may be specific disturbances that are not encompassed very well by the proposed criteria. For instance, the central bank may wish to react to short-term volatility of the exchange rate and/or disorderly market conditions as a pre-emptive measure to reduce the probability of running into a situation described in the above consistency-criteria. Another example (specific to the transition economies) might be a presence of large and volatile privatisation revenues, such as

in the Czech case. In these cases, an action of the central bank, such as "technical" interventions to sustain market liquidity or the Czech agreement on the privatisation revenues, might be justified. Personally, though, I would view these instances as exceptions from the above rules rather than as arguments for giving up the rules altogether. An analogy can be once again made with the interest rate decisions. The inflation targeting rules are often interpreted in a flexible manner and many escape clauses are defined to accommodate periods of clearly identifiable, exceptional shocks.

To sum the above three points, the criteria should be viewed as flexible rules, whose primary aim is to discipline the decision making process, make it more transparent and credible. The rules give room for exceptions, but these would not be possible to specify without defining the rules in the first instance. I believe that this approach is consistent with the main mission of inflation targeting, which is not mechanical target hitting, but constraining the discretion aimed at achieving credibility and flexibility at the same time.

On the other hand, there is one distinction of the interventions' criteria compared with the interest rate decisions. Even meeting the criteria is not sufficient to justify the actual use of interventions. It is only a signal to consider additional factors such as constraints on further cuts of the interest rates (danger of bubbles, low "substitutability" of the interest rate and exchange rate component of the monetary conditions in the particular situation, etc.), expected effectiveness of interventions (market conditions), sterilisation costs (section 4.5), and so on. As a result, the "interventions reaction function" to the variables described in the above criteria is likely to be quite weak and unstable, compared with the actual interest rate reaction function.

We may try to assess the Czech experience since 1998 using the suggested definition of target-and-regime consistency, in order to illustrate their performance in the actual practice. I focus mainly on those criteria that are easy to quantify and assess. In the indecisive cases I present the interventions' explanations that can be found in the CNB's public documents plus some other tentative arguments, leaving the judgement to the reader if these could be considered sufficient justifications of using "escape clauses" from the quantifiable criteria.

In the first step, let me discuss whether the interventions had a direction that was in line with the required changes in the overall monetary conditions. Table 1 presents for each intervention period the deviation of inflation forecast from the target (ex ante consistency), the actual deviation of inflation from target (ex post consistency), the output gap, and the direction of interest rate changes (which should reflect the CNB's overall assessment of the situation, including the risks).[12]

From the ex ante view, we can see that most interventions against the CZK's appreciation were carried out during periods in which the inflation forecast was pointing below the target and the output gap was negative, which is consistent with the logic of inflation targeting. The only exceptions were the interventions during the first half of 1998, when the inflation forecast was

[12] It must be kept in mind that the inflation forecast is just one of the tools for the Bank Board decisions. Another one is a risk analysis embodied in the Board's discussions. As a result, in some of those cases when the interventions might look target-inconsistent based on the forecast alone, they might be justified by the assessment of risks. In the Czech reality, this is probably not true for the first half of 1998, when the minutes (and actual interest rate changes) reveal risks skewed rather to the upside. On the other hand, this argument might be valid for October 2001(even though the repo rate was kept on hold that month).

heading towards the upper band of the indicative target for December 1998, and the intervention in October 2001 when the forecast was more or less on target.[13] The output gap, though, was negative even in these months. Moreover, in most cases the interventions happened during periods of falling interest rates, which indicates that the CNB assessed monetary easing to be an appropriate policy response. The period till mid-1998 is again an exception in this respect, as the interest rates were in fact increased once during this period. Another exceptions are the interventions in early 2000 and October 2001, which fall into the relatively long period of stable interest rates. From the ex post view, all the interventions are consistent with the logic of inflation targeting, as the actual inflation fell significantly below the target, even in those cases when the forecast was on target or above its midpoint.

Table 1: Consistency of Interventions with Inflation Targeting

Month	Deviation from target [1/]	Ex post deviation [2/]	Output gap [3/]	Interest rate trend	Target consistency[4/]
02-03/1998	+0.5 %	-4.3 %	-1,6 %	→;↑	?
06/1998	+0.2 %	-4.3 %	-2.4 %	→	? (Y)
07/1998	-0.2 %	-4.3 %	-3.3 %	↓	Y
10/1999	-0.9 %	-1.5 %	-3.0 %	↓	Y
12/1999	-1.4 %	-1.5 %	-3.0 %	↓	Y
03/2000	-1.2 %	-1.5 %	-2.3 %	→	Y
10/2001	+0.3%	-3.2 %	-0.5 %	→	? (Y)
12/2001	-0.5 %	-3.2 %	-0.5 %	↓	Y
01/2002	-0.9 %	-4.1 %	-0.5 %	↓	Y
04/2002	-1.0 %	-3.8 %	-0.9 %	↓	Y
07-09/2002 [5/]	-1.3 %	-3.7 %	-1.5 %	↓	Y

***Source**: Czech National Bank; own computations.*

***Notes**: 1/ Deviation of the CNB's inflation forecast from centre of the target twelve months ahead (for net inflation targeting the announced targets closest to the twelve months horizon were used). 2/ Deviation of actual inflation after one year (or closest to that) from centre of the target. 3/ Ex post assessment in July 2003 (the CNB's forecasts did not work explicitly with the output gap till July 2002, so no ex ante assessment is available). 4/ Author's subjective assessment of the ex ante consistency (ex post consistency given in brackets in indecisive cases). 5/ Unconditional inflation forecast, including an explicit assessment of the current output gap.*

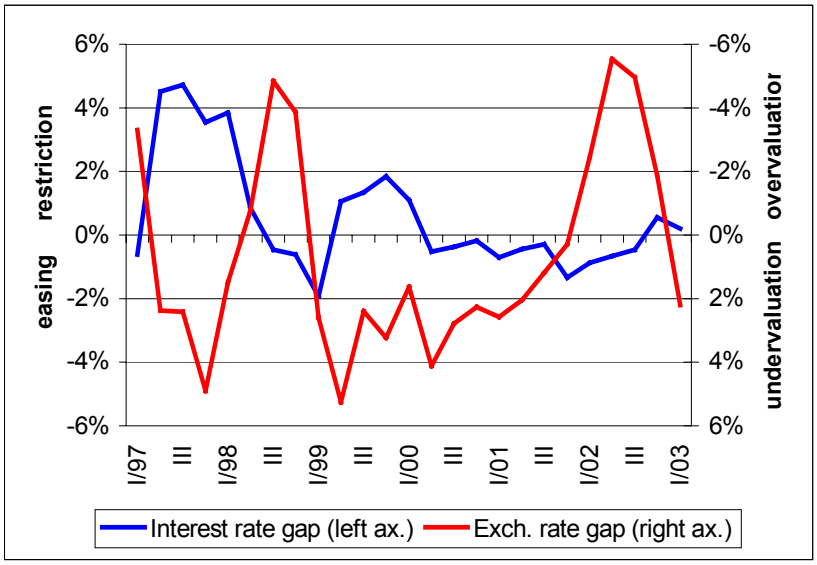
On the other hand, we could hardly find periods in which interventions to support the CZK would have been target-consistent, as the whole period since 1998 has been characterised by subdued economic activity and frequent inflation target undershooting. This addresses the question of asymmetry in the CNB's interventions (see section 4.1). According to the criteria applied here, this asymmetry was in fact consistent with the inflation targeting regime – as the conditions were asymmetrically biased towards monetary easing – and does not signal a departure from managed floating (or "independent floating" to use the terminology of Bofinger and Wollmershaeuser, 2002).

The second, and more strict, criterion of the interventions' consistency is to see whether the monetary conditions mix was appropriate for considering the interventions (i.e. lax interest rates

[13] The forecast in October 2001 was slightly above the centre of targeted corridor in the four-quarter outlook, but was heading towards its lower band for the remaining part of the most effective transmission horizon.

and overvalued exchange rate, or at least moving in that direction quickly). Such an assessment is made hard by the fact that the ex post judgement on the equilibrium real interest rate and exchange rate is often very different from the ex ante assessment, which is however not available for most of the analysed period. Moreover, there is a range of different theories to derive the equilibrium, which may often give contradictory results. To start with, I present the ex post assessment by the CNB's staff responsible for inflation forecasting in mid-2003 (Beneš and N'Diaye, 2003).[14]

Figure 9: Composition of Monetary Conditions



Source: *Computations by CNB forecasting staff, July 2003.*

As we can see, the exchange rate appears to have been overvalued in two periods: in the last three quarters of 1998 and during 2002. In those periods, real interest rate conditions we relaxed at the same time.[15] Therefore, the interventions pass easily the consistency criterion in these two instances. For the other periods, the judgement is more uncertain.

In early-1998, the exchange rate was probably still undervalued from the ex post view. The high real interest rates gave room for easing through the interest rate component of monetary conditions. There are thus three possible explanations for using the interventions in this period. First, the exchange rate equilibrium was assessed differently at that time compared with present. This is quite possible, taking into account the short time that had passed since the turmoil of May-1997 and the still high (even though falling) current account deficit. Second, the speed of change in the exchange rate might have been viewed as too fast by the CNB, and the interventions could be explained as a pre-emptive measure, trying to fight against possible future overvaluation. With a benefit of hindsight, this would be a valid argument. Third, the CNB might have been more or less satisfied with the overall monetary conditions (as indicated by Table 1), but it also liked its

[14] This expert assessment, however, should not to be interpreted as an official policy view.

[15] For 1998, though, this assessment needs to be taken cautiously, as the relatively low real interest rates were given by high inflation, which was partly driven by faster price deregulations that may have no relevance for assessing the impact of interest rate conditions on the aggregate demand.

mix and tried to prevent it from changing. A preference of restrictive interest rates and depreciated exchange rate could be motivated by a desire to stabilise the current account after the currency crisis, and to avoid spill-overs of capital flows volatility from the emerging market crises.[16] In other words, the policy may have followed the goal of external stabilisation, which is perhaps understandable for that turbulent period, but questionable in terms of the regime consistency with the inflation targeting. From an ex post point of view, faster interest rate cuts might have been more appropriate in that period (see also Holub and Tůma, 2001).

In late 1999 and early 2000, the exchange rate appears to have been undervalued in the ex-post point of view, while the interest rates were restrictive. The ex-post regime consistency of the interventions is thus fairly questionable for this period. The ex-ante motivation for the decision to intervene – rather then to cut the interest rates – can be found, for instance, in the minutes of the board meeting of October 4, 1999: "The sustainability of economic recovery…is to a certain extent connected to positive developments in the external sector. In the light of this relationship, the Bank Board indicated as a risk factor any sharp appreciation of the koruna that would threaten the inflation target for the year 2000. The direct impact of koruna strengthening on net inflation and inflation expectations could possibly increase the likelihood of missing the inflation target." This suggests that at that time, the exchange rate's appreciation against the euro was not viewed as a modest correction of the previous marked undervaluation, but as a risk to the economic growth and the inflation target. In relation to this, it is important to note that the CNB did not use a "gap-methodology" in its forecasting process at that time, which means that it was concerned with changes in the exchange rate rather than its deviations from the equilibrium. Another question is why the CNB did not use interest rate cuts rather than interventions to address this risk. The explanation can be again found in the same minutes. First, the Board thought that "short-term capital motivated by the interest rate differential was not a source of appreciation pressure", and that the shock was coming from – possibly exaggerated – market expectations of a future appreciation related to the FDI inflows. Second, a concern was expressed that the appreciation could be later on replaced with a sharp depreciation with negative consequences for the overall stability. Third, the time lag between the exchange rate and inflation was believed to be shorter than the transmission of interest rates changes. And last, the interest rates were viewed as "in principle consistent with the level achieved in the economic cycle", i.e. not restrictive. Taking all these arguments into account, the judgement of the interventions' ex ante consistency might perhaps be more positive than the ex post assessment.[17]

Finally, concerning the interventions in late-2001 the ex post view says that the exchange rate was close to its equilibrium rather than overvalued. In this case, though, I would not judge the interventions as regime inconsistent for several reasons. First, in the ex ante point of view the exchange rate was already assessed as overvalued in October 2001 Situational Report (by about 2 %) and the subsequent appreciation strengthened this belief. Second, the speed of the exchange

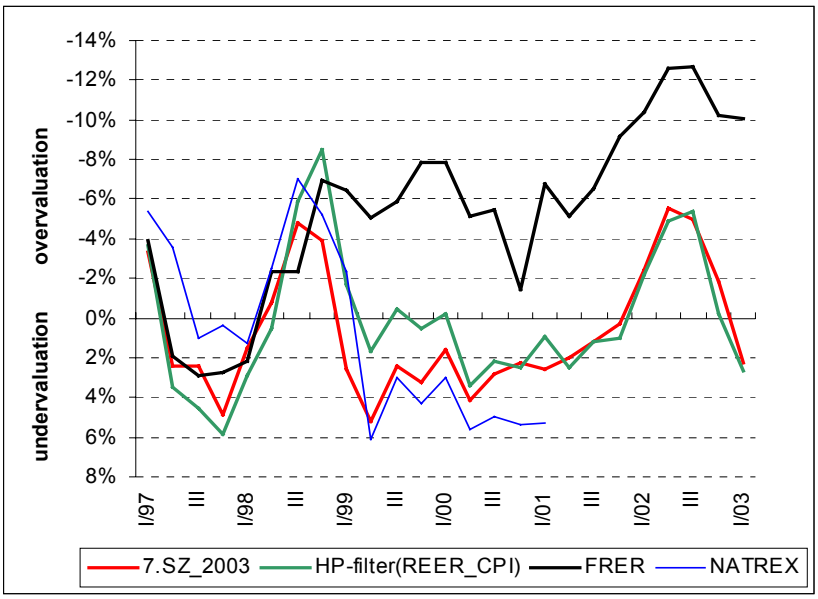
[16] The latter explanation is, among other things, supported by the IMF's Staff Report for the 2000 Article IV Consultation on the Czech Republic, August 2000.

[17] Some open questions still remain, though. For example, one may ask whether it was appropriate to pay so much attention to the short-run primary effects of the exchange rate changes. Moreover, it is not clear if the expectations of future FDIs did not represent a fundamental factor at that time, meaning that the appreciation was not a destabilising shock coming from the foreign exchange market. At the same time, the fact that real interest rates were in principle not viewed as restrictive does not in itself constitute a sufficient argument that the interest rates could not have been lowered further. Finally, note that the short-term exchange rate volatility does not appear to have been exceptionally high during that period.

rate appreciation was very large, justifying a worry about a further substantial appreciation, thus calling for a pre-emptive action. Third, the short-term exchange rate volatility also started to increase in that period (see Figure 6 above). And fourth, the interest rates were judged as lax at that period, which also corresponds to the current assessment.

To conclude this section, I present in Figure 10 some alternative estimates of the exchange rate gap to show the robustness of the above judgements. Besides the series presented in Figure 9, I add deviations of the real effective exchange rate (CPI-based) from its Hodrick-Prescott (HP) trend, deviations from the natural exchange rate (NATREX) estimated by Frait and Komárek (1999), and deviations from the fundamental real exchange rate (FRER) as estimated in Šmídková, et al. (2002).[18]

Figure 10: Alternative Estimates of the Exchange Rate Gap



Source: *CNB; Frait and Komárek (1999); Šmídková, et al. (2002).*

Figure 10 shows the high degree of uncertainty surrounding the estimates of equilibrium exchange rates. This uncertainty does not, however, change the assessment at least for two intervention periods. In mid-1998 and during 2002, all methods indicate a substantial overvaluation of the Czech crown, even though its estimated magnitude may differ.[19] Concerning the other periods, the alternative estimates would generally lead to a more positive assessment of the interventions' regime-consistency. In particular, in late-1999 and early-2000, the exchange rate more or less corresponded to its H-P trend. The FRER estimate even suggests an overvaluation of the exchange rate rather than its undervaluation, which could justify the interventions.[20] The results of

[18] The NATREX estimate is an updated version, which I received from the authors. Nevertheless, it is still available till 2001 only.

[19] It is fair to say, though, that the NATREX estimate, which is not available for 2002, indicated such a degree of undervaluation in early-2001 that the exchange rate might have not been seriously overvalued according to this methodology one year later.

[20] The FRER overvaluation in this period relates to the point estimate, but the exchange rate was still within the confidence band for the estimated equilibrium, which could also be interpreted as a broadly appropriate exchange rate (see Šmídková, et al., 2002).

the FRER also suggest a significant overvaluation in late-2001, shading a more positive light on the interventions in these months. But it is true that the FRER exchange rate gap deviates substantially from all other methods, and probably needs to be treated with a degree of caution due to its growing trend.

4.3 Procedural Consistency with Inflation Targeting

As already mentioned at the beginning of the previous sub-section, the consistency of foreign exchange interventions with the inflation targeting regime can also be assessed in terms of procedures that are followed in the decision-making process and its public communication. After all, the main constraint that the inflation targeting places on the policy makers consists in the need to observe such procedural rules. This is true also for the Czech monetary policy regime, which has evolved into a transparent and rule-based framework, as far as the interest rate decisions are concerned (see section 3). An open question, however, which the literature on managed floating does not address so far in most cases, is to what degree the same procedural principles can – and should – be applied also to foreign exchange interventions under the inflation targeting regime.

Typically, the procedures governing the decisions on interventions are much less clearly defined than the rules for interest rates. The international standards on the transparency of exchange rate management policies are quite vague, compared with other policy areas. On the one hand it is argued in favour of clarity of the mandate, rules and procedures for the central bank (or other public agencies responsible for the interventions). On the other hand, it is acknowledged that "there are circumstances in which it would be inappropriate for central bank to disclose their near-term monetary and exchange rate policy implementation tactics and provide detailed information on foreign exchange operations" (IMF, 1999; see also Chiu, 2003). This may be a source of problems, as the credibility of the inflation targeting crucially depends on observing its key principles. Therefore, some central banks have tried to make the rules for interventions clearer and the decisions more transparent. The Sveriges Riksbank (2002) has been one of the leaders in this respect.[21] But even in this case, the rules have remained fairly general and "discretionary". As argued in Chiu (2003), "the relationship between transparency in monetary policy and that in foreign exchange interventions is by no means straightforward" so far.

The difficulty in defining clear procedures may be partly connected to the fact that the economic literature gives no clear guidance in this respect. The inflation targeting literature is silent on this issue (see Section 2), and the literature on the effectiveness of the interventions leads to differing conclusions, based on which channel of their transmission is emphasised. Speaking for example about the transparency procedures, if one relies on the signalling effect, a logical recommendation would be to carry out open foreign exchange interventions. On the other hand, if one bets on the order flow effect, policy announcements may be counterproductive (see Canales-Kriljenko, et al., 2003; Chiu, 2003). The higher degree of secrecy in communication of interventions may also partly be a heritage of the past, as the pegged exchange rate regimes and interventions used to be most popular until the 1990s, when the central bank transparency was not a priority.

[21] Chiu (2003) argues that the Canadian system has also become quite transparent in terms of its objectives and openness since 1998, but it has not been tested by any actual intervention episode so far.

Nevertheless, the lack of transparency and other operational rules may also have good economic rationale. The central banks' role and position in the foreign exchange market differs fundamentally from its role in the money market. While in the money market, central banks have an almost perfect control over the short-term interest rates, in the foreign exchange market they are only one of many players, too weak to lean against the market. The central bank can, for example, afford to discuss openly the pros and cons of its interest-rate decisions and possibly signal the likely direction of its future actions. This does not weaken its impact on the short-end of the yield curve, and may only increase – and make more predictable – its impact on the longer-term interest rates. On the other hand, foreign exchange interventions may be ineffective when anticipated by the market, as they may have no further signalling effect or impact on the risk premium. It could also be strongly counterproductive if the central bank expressed any doubts about the interventions' effectiveness or appropriateness. This could weaken the signalling effect of interventions, in the former case by undermining the market's confidence in their effectiveness, and in the later case by weakening the belief of the market that the central bank may have a strong information advantage in comparison with private analyses. Publishing the voting ratios and/or dissenting views in the real-time might thus be damaging.[22]

Looking at the international experience, Chiu (2003) surveys the transparency procedures in foreign exchange interventions of ten countries with floating exchange rate (except of Hong Kong), one half of which have inflation targeting central banks at present (Australia, Canada, Korea, Switzerland and the UK). The general conclusion is that "there are considerable differences in the disclosure policy even among countries practising the same exchange rate regime."[23] The same is true even if one looks on the subset of inflation targeting central banks. It is suggested in Chiu (2003) that "benefits tend to outweigh risks in enhancing the transparency of objectives and the actual operations." In most real cases, though, the definition of objectives is quite broad and leaves much discretion to the central banks concerning the actual operational objectives of interventions. It is also argued in Chiu (2003) that the interventions data should be published with some time leg due to accountability reasons, but that real-time transparency might be somewhat risky. Finally, the author thinks that a degree of constructive ambiguity in the interventions' tactics is justified.

Let me now look at the communication of foreign exchange interventions in the Czech Republic. Sometimes, the fact that the CNB was intervening was announced immediately (e.g. on 31st March 1998, 4th October 1999, 21st January 2002, or most recently 10th April 2002; see Table 2), but on other occasions the CNB carried out "undisclosed" interventions (e.g. in December 2001 or in July-September 2002). Discussions of the exchange rate issues appeared in the minutes of the regular monetary policy meetings or extraordinary monetary policy meetings at which interest-rate decisions were discussed. Only sometimes, however, the minutes did also include clear information on interventions. This happened either in the case of extraordinary meetings called due to the exchange rate developments (such as on 21st January 2002 or 11th July 2002) or in the case of regular meetings (e.g. 4th October 1999, 30th March 2000, and 25th October 2001). But an information on the voting ration was given only in some of those cases when the decision was

[22] It might still be possible and advisable, though, to publish the Board discussions with rather a long time lang for the accountability reasons.

[23] It is suggested in Chiu (2003), though, that the more frequently intervening countries tend to be less open in the communication. The distinction between the de jure and de facto exchange rate regimes along the lines of Calvo and Reinhart (2000) or Bofinger and Wolmershauser (2001) might thus modify this conclusion somewhat.

unanimous.[24] The CNB also published its agreement with the government, including the alternatives that had been considered; in this exceptional case the exchange rate policy was very transparent.

Table 2: Communication of the Interventions - an overview

Starting month	Final month	Short description
02/1998	04/1998	Open interventions on 31 March announced by a press release (but interventions already in February), no minutes
06/1998	07/1998	Open entry to the market on 14 July; stated in minutes of the monetary policy Board meeting of 16 July
10/1999	10/1999	Open interventions on 4 October, published in minutes (detailed explanation; unanimous voting)
12/1999	12/1999	Minutes only mention a consensus view on the necessity to prevent excessive appreciation (+warning against interventions was given already in November)
03/2000	03/2000	Open interventions on 30 March, announced by press release, published in minutes (unanimous decision)
10/2001	01/2002	25 October: regular MP meeting, decision to intervene published in minutes (unanimous); 20 December: regular meeting, interventions discussed, but no decision announced; 21 January 2002: extraordinary meeting, interventions announced and published in separate minutes (unanimous decision)
04/2002	04/2002	4 April: extraordinary MP meeting, interventions announced by press release; 10 April: interventions with a press release
07/2002	09/2002	11 July: extraordinary meeting, no decisions announced immediately, minutes include decision on interventions (no voting ratio); subsequent interventions not disclosed directly

The monthly volume of interventions is published with a lag of two months (since July 1998), which is the main regular channel for communicating the interventions (even though the intervention volume can be also estimated from the CNB's balance sheet, published every ten days). As reported by Canales-Kriljenko (2003), interventions volumes are published only by 25 percent of all central banks that responded to a survey's questions concerning the transparency of their interventions policy. This means that the CNB belongs to the minority group of more transparent central banks in this respect (even though some other banks publish daily intervention volumes, which is a further step in transparency). It can be thus concluded that some minimal communication standards are in place concerning the CNB's decisions on foreign exchange interventions, but a considerable degree of discretion remains in this area, unlike for the interest-rate decisions.

Other institutional aspects of interventions also differ from the interest-rate decisions. While the interest rates are adjusted based on comparing the inflation forecast with the targets in a pre-specified time horizon (and taking into account an explicit list of escape clauses), no such clear

[24] In mid-2001, the CNB's Board decided to publish full transcripts of its monetary policy meetings with a lag of six years. This means that the details of the interventions' debates from these meetings will also become public. Nevertheless, these transcripts are produced from those meetings only at which the interest rate changes are discussed.

rules exist for the interventions. No sufficiently clear written opinion has been explicitly given – either externally or at least internally – under what circumstances are the foreign exchange interventions consistent with the current policy regime.[25] In contrast with the Situational Report used at the regular monetary policy meeting to decide on the interest rates, no standardised material for the Board's discussions on interventions exists, etc. All of this may sometimes create challenging tensions in the monetary policy regime.

These challenges are, in my opinion, a strong argument for the central banks pursuing inflation targeting in the less open economies to avoid using the foreign exchange interventions altogether and let the currency float freely. In the very open economies, however, it is not clear whether the central banks can afford to do this just due to procedural consistency and the associated credibility reasons. In their case, the decisions on the frequency of interventions thus needs to take into account other factors as well, such as their effectiveness, sterilisation costs, etc. Once the central bank decides to use the interventions, however, it should set at least some minimal rules and procedural steps to make the interventions more transparent, which should include a clearer definition of the interventions' consistency with the policy regime and their public communication strategy. An open communication of dissenting views on the interventions, though, should not be a part of this communication strategy, in my opinion, as it could weaken their effectiveness (if there is any at all).

4.4 Effectiveness of Exchange Rate Management

It would require a detailed econometric analysis to judge whether and to what extent the foreign exchange interventions and other policy measures were effective in influencing the exchange rate developments. Moreover, one would need to analyse not only what actually happened after the interventions, but also compare this to what would have happened without them, in order to judge their effectiveness properly. This is however extremely difficult and time-consuming to do, not least because we are still lacking a reliable model describing the short-run dynamics of the exchange rates. It would also be necessary to study in detail the microstructure of the CZK's market (see Derviz, 2003 for such an analysis), which goes beyond the scope of this policy note. I thus limit myself to an informal discussion of the stylised facts only.

In some cases, the interventions seem to have had a visible immediate impact on the exchange rate. A typical example is March 2000, in which interventions of slightly less than EUR 400 million took place[26], the exchange rate depreciated almost by 2 %, and remained at a weaker level till mid-2000. Another similar case is February-April 1998, even though this time the CZK's weakening was more short-lived (till the beginning of May 1998), despite a relatively high volume of interventions (see Table 3). In October 1999, the interventions reached almost EUR 1 billion, and the exchange rate depreciated by more than 3 %, and remained weaker till mid-December 1999. In some other situations, the impact was much less clear. For example in June -

[25] Spoken opinion is given to the Bank Board by the Financial markets department on the motivations for interventions and the prevailing market conditions. Typically, the motivation was described as creating two-way risk in the situations of one-sided market expectations. While not in conflict with my suggestions, I believe that this mechanism is not sufficiently systematic.

[26] To get a feeling of the relative scope of the CNB's interventions, note that the average daily turnover in the CZK foreign exchange market was about USD 700-800 million (EUR 800-820 million) in 2002. The Czech yearly GDP is equivalent to roughly EUR 70-75 billion.

July 1998, the CNB bought about EUR 500 million, but the crown depreciated only with some lag, which coincided with the break-out of the Russian crisis. There were even cases in which the short-term impact of interventions was quite weak and non-lasting, such as in December 1999 or in late-2001 (see Table 3), even though it may be true that without these interventions the exchange rate might have went on appreciating further.

Table 3: Effectiveness of Foreign Exchange Interventions since 1998 - an overview

Starting month	Final month	Overall volume	CZK/EUR (ECU prior to 1999)						
(t)	(T)	EUR million	t-3M average	t-1M average	Start of t	Low of [t;T]	End of T	T+1M average	T+3M average
02/1998	04/1998	1285	37.87	38.50	38.37	36.30	36.46	36.11	35.11
06/1998	07/1998	508	36.95	36.11	36.49	34.35	34.35	35.47	35.17
10/1999	10/1999	966	36.52	36.36	35.72	35.68	36.62	36.40	36.03
12/1999	12/1999	229	36.36	36.40	36.08	35.83	36.13	36.03	35.60
03/2000	03/2000	394	36.05	35.71	35.65	35.53	35.63	36.31	36.02
10/2001	01/2002	643	33.86	34.19	33.91	31.46	31.92	31.79	30.36
04/2002	04/2002	1 009	32.08	31.39	30.62	30.06	30.63	30.56	29.75
07/2002	09/2002	954	30.36	30.30	29.25	28.97	30.30	30.65	31.19

Source: *Czech National Bank.*

The immediate impact thus looks quite uncertain, but occasionally might last up to 2 or 3 months. No particular "ideal" intervention strategy (e.g. open vs. undisclosed; large vs. smaller; etc.) can be identified at first sight, though. Something that did work in one situation may have had little effect in another one. Moreover, even many of the "successful" interventions were not able to reverse longer-run appreciating tendencies sufficiently quickly. As a result, they did not prevent relatively prolonged periods of exchange rate overvaluation in 1998 or in 2002 (see section 4.1). A key issue for the effectiveness seems to be how the interventions interact with the market expectations, which may be very different in different periods. This is, unfortunately, quite hard to tell before the intervention is actually carried out; and the term "market expectations" may in fact serve just as an ex-post explanation for the previous predictions on the interventions' effectiveness having gone wrong.

As concerns the most recent experience in late-2001 and during 2002, it fits rather well into this picture. When the exchange rate started to appreciate abruptly in the second half of 2001 (see Figure 4 above), it was usually being attributed by analysts and market participants to expectations of future foreign exchange privatisation revenues. The CNB tried to resist this tendency with foreign exchange interventions in October 2001 (EUR 240 million) and December 2001 (EUR 100 million). At the same time, from October 2001 the CNB had signalled to the market its intention to reach an agreement with the government on the privatisation revenues. Nevertheless, the market seemed to be discounting this information heavily, and the expectations remained biased towards appreciation. When the agreement was approved on 16 January 2002, it had surprisingly little effect on the market, even though its mechanisms were very strong and

removed the major alleged source of appreciation.[27] The major explanation for the continued strengthening shifted from the privatisation revenues to the long-run real appreciation trend of the Czech crown.

Therefore, the CNB Board held an extraordinary meeting on 21 January 2002, at which it decided to carry out open foreign exchange interventions (altogether EUR 305 million in January 2002) and an interest rate cut of 0.25 % points. The CZK weakened by slightly less than 1.5 % on that day, but was back to its pre-intervention level in four days and continued strengthening at an even accelerated pace till the beginning of April 2002. On 4 April, the CNB thus started to openly intervene again. Overall, the volume of interventions reached EUR 1 billion during April 2002. The exchange rate ended this month where it stood at its beginning (see Table 3), which was perhaps a bit disappointing result given the high intervention volume, even though the appreciation tendency was at least halted till late-June 2002. This experience suggests that even relatively large interventions may have a modest effect at best when the market expectations are set in one direction and the central bank tries to "lean against the wind".

Nevertheless, the "undisclosed" interventions that the CNB used in July-September 2002 (together roughly EUR 1 billion) seem to have had an important effect. The CZK/EUR exchange rate ended the year 9 % weaker compared to its all-time high of 10 July, 2002, and has so far remained relatively weak in 2003 as well. The effectiveness of these interventions can be explained by a combination of several factors. These included: (i) a change in the market expectations, supported by some adverse macroeconomic news (partly due to an error in trade statistics); (ii) negative interest rate differential, making the CZK less attractive for investors; (iii) change in the market's perception on the sterilisation costs after the interest rate differential became negative; (iv) implementation of the agreement with the government in practice, combined with delays in further privatisation, etc.

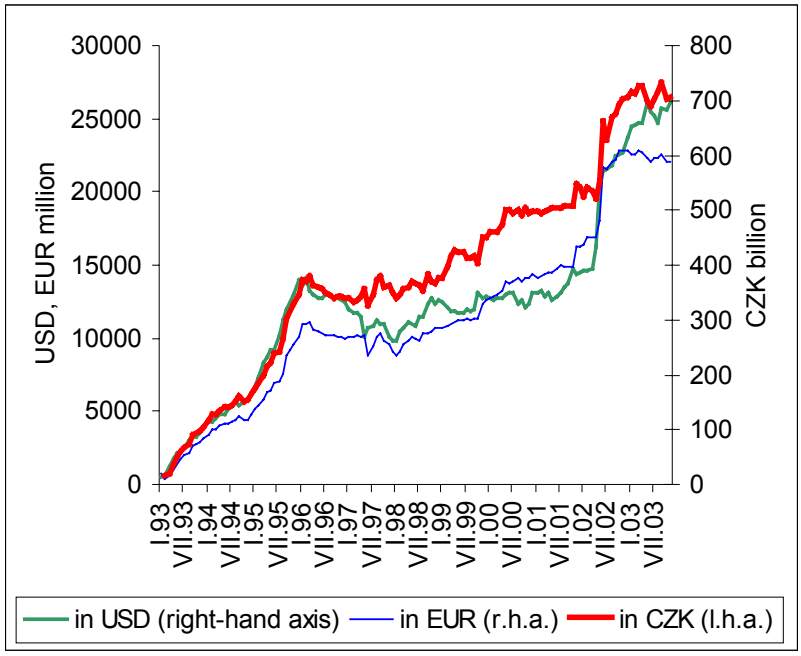
The changed market expectations were probably the most important factor. Once the market expectations ceased to be skewed towards appreciation and the one-sided bets became less interesting due to a combination of zero interest rate differential with more exchange rate uncertainty, it was perhaps a matter of time only when some negative fundamental news would initiate a correction. And to the extent that the policy measures (interest rate cuts, interventions and the agreement) contributed to this change, we can say that they have had a medium-term impact on the exchange rate. This medium-term effect was – perhaps surprisingly – stronger than the immediate impact. This highlights the signalling role of foreign exchange interventions as opposed to their "market-equilibrating" effect. At the same time, it is very difficult to assess the contribution of interventions in isolation from other factors and policy steps (such as interest rate changes), and it is therefore not possible to arrive at a clearly positive "cost-benefit" judgement on their role in the Czech inflation targeting framework.

[27] The minutes of the 21 January extraordinary Board meeting state: "The rapid strengthening of the koruna observed at the end of 2001 was primarily linked to the anticipation of converting a significant part of the state's foreign exchange incomes into Czech koruna. It was stated that considering the extent of the approved measures (i.e the agreement with the government), the exchange rate was likely to shift back to a level corresponding to the economic fundamentals. However, the exchange rate did not react in this way, and as a result, monetary conditions were disproportionately tightened." (see www.cnb.cz)

4.5 Foreign Exchange Reserves and Sterilisation Costs

The foreign exchange interventions and purchases from the government within the special agreement have resulted in a growth of the CNB's foreign exchange reserves. Their development is illustrated in Figure 11. The volume of foreign exchange reserves was growing rapidly during the period of fixed exchange rate and fast capital inflows till 1996. After declining during 1997, they started to grow very gradually again due to the occasional interventions from 1998 till early-2000. Since late-2001, the reserves have increased dramatically, though, to over EUR 22.5 billion (CZK 700 billion).

Figure 11: CNB's Foreign Exchange Reserves



Source: *Czech National Bank.*

This has import implications for the structure of the CNB's balance sheet, and consequently for its financial results. The volume of foreign exchange reserves exceeds the currency in circulation more than 3-times. The liquidity is sterilised using reverse repo operations, the volume of sterilisation reaching about CZK 500 billion at present. This means that the "sterilisation costs" may be substantial compared with the monetary income (seigniorage) the CNB can earn due to its monopoly to issue currency. Indeed, there are accumulated losses from the past in the CNB's books that reached CZK 53.8 billion at the end of 2002.[28]

The overall sterilisation costs (*SC*) can be estimated as a difference between the CZK yield on net foreign exchange reserves and the yield the central bank could earn by investing the same amount of money in the domestic money market (or by reducing the volume of reverse repo operations by the same amount), i.e.

[28] These accumulated losses, however, do not reflect the sterilisation costs only, but also past quasi-fiscal operations of the central bank, such as its involvement in the clean-ups of ailing banks (Holub, 2001) of the cost of federation split-up. These transformation costs alone have exceeded the CNB's accumulated loss.

$$SC=[i^d-(i^f+e)]FXR \qquad (1),$$

where i^d denotes the domestic interest rate, i^f foreign interest rate, e percentage exchange rate depreciation, and FXR (net) foreign exchange reserves.[29]

Moreover, we may assume that the domestic interest rates are tied (at least in the medium and longer run) to the foreign ones by the UIP condition

$$i^d = i^f + E(e) + \rho \qquad (2),$$

where $E(e)$ is the expected depreciation of the exchange rate and ρ is a risk premium. Consequently, the sterilisation costs equal

$$SC=[(E(e)- e)+ \rho]FXR \qquad (3).$$

This means, first of all, that the central bank is exposed to exchange rate losses/gains due to unexpected exchange rate appreciations/depreciations, making the central bank's profits very volatile if its open foreign exchange position is large. The CNB, for example, experienced an exchange rate gain of CZK 44.7 billion in 1997 and CZK 31.5 billion in 1999, and a loss of CZK 35.6 billion in 1998 and 40.1 billion in 2001. However, these unexpected losses/gains should roughly average out over the long run, at least if the expectations are rational.[30] The second kind of costs, though, is a systematic one – it stems from the risk premium on domestic assets, if this is positive. This effect is the higher, the higher are central bank's net foreign exchange reserves. It may thus become very important especially if reserves exceed the monetary base several times as in the CNB's case.

In Table 4, I show a simple estimate of the CNB's costs of holding net foreign exchange reserves, calculated in line with equation (1), for the period of 1993-2002.[31] As we can see, the estimated sterilisation costs were increasing from 1993 to 1996. The central bank accumulated more and more foreign exchange reserves, which were to a large extent being sterilised by issuing the CNB's treasury bills that had to bear a higher interest rate than the foreign exchange reserves were earning. In 1996, in addition, the costs of foreign exchange reserves were increased by an appreciation of the exchange rate within its widened fluctuation band. Since 1997, i.e. under the floating, the estimated costs have been very volatile due to exchange rate changes, but were still negative on average. As a result, the total sum of these costs since 1993 has reached about CZK 165 billion (7-8 % of yearly GDP at present).

[29] For a more detailed discussion of the sterilisation costs, see Holub (2001).

[30] This does not mean that the accounting exchange rate losses will be zero on average. For example, if the long-run trend is towards a modest nominal appreciation, such losses could be expected to be quite substantial. I am speaking here about the unexpected losses, though, which can be understood as zero-mean shocks to the UIP condition.

[31] For the period since 1997, I used the interest earnings and exchange rate gains/losses on the CNB's foreign exchange reserves that were stated in its annual reports. For the earlier period, I approximated these earnings and gains/losses only. I used a weighted average of short-term money market interest rates in Germany (65 %) and the USA (35 %) as a proxy for foreign interest rates, and weighted percentage changes of the CZK's exchange rate against the DEM (65 %) and USD (35 %) to calculate the exchange rate gains/losses. I used the CNB's two-week repo-rate (and 2W PRIBOR for the period before 1996) as the domestic interest rate.

We can thus see that the CNB's opportunity losses stemming from the existence of risk premium and exchange rate fluctuations have indeed had a strong empirical relevance. Nevertheless, the computations presented here are only a rough measure of the interventions' true costs. First, they include the losses associated with the foreign exchange interventions carried out during the fixed exchange rate period, not only the losses attributable to the managed floating period since 1997-98. Second, they do not deal with each intervention separately. For example, if an intervention is carried out in a period when the exchange rate is seriously overvalued and is followed with an exchange rate correction, it should become profitable at least in the short-to-medium run. Third, there is a strong ceteris paribus assumption embodied in the calculations. In particular, we have assumed that none of the variables in equation (1) (i.e. the domestic interest rate and the exchange rate) is influenced by the decision to intervene or not, except of the volume of net foreign exchange reserves. This is naturally a big simplification, which is de facto equivalent to assuming that the interventions do not matter (But why would we then care about their costs?). A success of an intervention can make it profitable. On the other hand, if the intervention allows the central bank not to lower the domestic interest rates, it may increase the sterilisation costs, making the overall result uncertain.

Table 4: Estimated "Sterilisation Costs" (CZK billion)

	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Net foreign assets	24	112	248	342	359	378	439	488	510	633
Domestic int. rate (in %)	11.1	8.6	10.9	12.0	14.0	13.8	6.6	5.3	5.1	3.5
Foreign int. rate (in %)	5.9	4.9	5.0	4.0	4.0	4.1	3.5	5.1	5.5	4.3
ER gains/losses	-0.3	0.0	0.2	-8.6	44.7	-35.6	31.8	-3.5	-40.1	-26.2
Estimated costs of FXR	-1.6	-4.1	-14.5	-36.1	8.6	-72.1	18.5	-4.4	-38.1	-20.9

Source: *Czech National Bank; own computations.*

In any case, the financial costs of interventions should be taken into account – and compared with the expected macroeconomic benefits – when discussing the exchange rate management internally. Concerning the external communication, it might be harmful to discuss the sterilisation costs systematically. It might undermine the interventions' credibility in those circumstances when the sterilisation costs are potentially high, which might further increase them, as unsuccessful interventions tend to be more costly than the successful ones (there is thus a self-fulfilling element in the interventions' financial credibility). If the financial credibility is already low, however, it might be helpful to strengthen it by making the interventions more sustainable. For example, the CNB's agreement with the government has included as its crucial part the government's participation on sterilisation costs incurred by the CNB due to the direct purchases of public foreign exchange revenues. This provision has made the agreement financially sustainable, and thus more credible. Similarly, the credibility of the CNB's foreign exchange interventions increased when the interest-rate differential vis-à-vis eurozone became negative, which led to the interventions being viewed as profitable by the market. The financial aspects are thus important from the credibility point of view.[32]

[32] Note that this credibility aspect is exactly the opposite to what has been suggested by Mussa (1981). He has argued that the possibility of central bank's losses is positive for credibility, because it can work as a commitment device. In our case, it was the reduction of the possible losses that helped, by causing the interventions to be viewed as financially sustainable.

5. Summary and Conclusions

In this paper, I discussed the role of foreign exchange interventions in the inflation-targeting regime, concentrating on the Czech experience since 1998.

I stressed that the inflation targeting literature gives little guidance on how to use the interventions under this regime. The theory usually assumes – and often explicitly recommends – pure floating under which the central bank influences the exchange rate via the interest rates only. If we assume perfect capital mobility, there are few channels through which the interventions could have a systematic and predictable impact on the exchange rate. However, there is also an alternative view, which assumes an imperfect substitutability between domestic and foreign assets, giving the central bank an opportunity to influence the exchange rate by carrying out interventions in an appropriate volume.

Since May 1997, the Czech Republic has operated a managed floating exchange rate with the euro (previously the DEM) serving as a reference currency. In line with that, the CNB has intervened occasionally in the foreign exchange market. With the exception of the year 1997, the interventions were directed against the CZK's appreciation only. The periods of intervention activity included December 1997 to July 1998. October 1999 to March 2000, and the period from late-2001 till September 2002.

Moreover, a special account for the government's foreign exchange privatisation revenues was established at the CNB in early-2000, and strengthened by an agreement between the CNB and the government in January 2002. This agreement has kept all the government's foreign exchange revenues out of the market and at the same time allowed the government to finance its fiscal needs. So far, the CNB has purchased over EUR 4.2 billion directly from the state. The agreement includes the government's participation on sterilisation costs of the CNB due to these direct purchases.

To judge whether the foreign exchange interventions are consistent with the inflation targeting regime. I propose three basic criteria. First, interventions against appreciation should be limited to cases when a monetary easing is consistent with the inflation targeting (and vice versa for interventions to support the currency). This means that the inflation forecast must point below the target and/or the output gap must be negative. Second, the interest rates should be relaxed and declining, reflecting that the primary tool has been used in line with the inflation targeting logic. It implies that the interventions should always be to some extent non-sterilised, to use the terminology of the traditional literature. Third, the exchange rate developments should be viewed as one of the direct shocks causing the target undershooting, meaning that the exchange rate is judged as seriously overvalued in comparison with the fundamentals. The three requirements assure that the supplementary monetary policy tool (i.e. interventions) should not send confusing signals compared with the main one (interest rates). The last two criteria also imply that the interventions might be considered only if the mix of monetary conditions includes loose interest rates and a tight exchange rate component, or is at least moving in that direction quickly.

In my opinion, central banks that want to use foreign exchange interventions as part of the inflation targeting regime should define such criteria of their target and regime consistency, and use them in the decision-making process, as well as in public communication. Nevertheless, the

criteria should be used as "flexible rules" for the interventions, allowing for possible escape clauses such as the situations of disorderly and volatile markets or large privatisation sales. It also needs to be stressed that the criteria must be viewed as necessary, but not sufficient conditions for the actual use of interventions. Other additional factors must be considered as well, e.g. the constraints on further interest rate cuts (danger of bubbles etc.), expected effectiveness of interventions under the prevailing market conditions, sterilisation costs, etc. The criteria thus do not imply a reliable "intervention reaction function" of the central bank to exchange rate shocks. The decisions will thus continue be more discretionary in this area compared with the interest rate decisions.

Using the proposed criteria to assess the CNB's interventions, I found out that they can be all judged as ex-post target-consistent, as the whole period since 1998 has been characterised by frequent target undershooting, negative output gap and falling interest rates. From the ex-ante perspective, the judgement is less clear for the interventions in early-1998, when the inflation was expected to be in the upper half of the targeted interval, and in October 2001, when the inflation forecast was on target. In these periods, however, the interventions could be justified at least by a negative output gap.

The monetary conditions mix was consistent with the proposed criteria in mid-1998 and in 2002. The combination of restrictive interest rate conditions and loose exchange rate conditions in early-1998 suggests that the CNB might have followed the goal of external stabilisation besides the inflation target, which is understandable for the given circumstances, but questionable in terms of consistency with the newly introduced inflation targeting regime. Similar questions arise also about the interventions in late 1999 and early-2000, as there is no reliable evidence of an exchange rate overvaluation for that period. In October 2001, the exchange rate was probably close to its equilibrium from the current point of view, but the ex ante assessment was different, which justified – in combination with the fast speed of appreciation and increased short-term volatility – the use of foreign exchange interventions.

Concerning the effectiveness of the interventions, it seems that sometimes they might have had an immediate impact, which might last up to 2 or 3 months. However, no particular "ideal" intervention strategy can be identified at first sight. Something that did work in one situation may have little effect in another one. Moreover, even many of the "successful" interventions were not able to reverse longer-run appreciating tendencies quickly. As a result, they were not able to prevent quite prolonged periods of exchange rate overvaluation in 1998 and in 2002. A key issue seems to be how the interventions interact with the market expectations, which is however hard to tell in advance.

The experience since late-2001 fits rather well into this picture. The interventions from October 2001 till April 2002 had quite a modest visible impact on the exchange rate despite their rather large overall volume. The initial impact of the CNB's agreement with the government was also disappointing. Nevertheless, the "undisclosed" interventions that the CNB used in July-September 2002 (together roughly EUR 1 billion) seem to have had an important effect thanks to a combination of several factors, a change in the market expectations being probably the most important of these. And to the extent that the policy measures contributed to these changed expectations, we can say that they have had a medium-term impact on the exchange rate.

It is, of course, hard to give any definite judgement based on the Czech case on the theoretical debate whether the central bank can or cannot use the foreign exchange interventions as a systematic policy instrument under the inflation targeting. In my opinion, though, the experience so far highlights the signalling role of foreign exchange interventions, as opposed to their ”market-equilibrating effect“. In other words, it seems that the central bank can hardly push the market where it wants to, but may try to influence the market expectations in a favourable way. This, however, implies a rather unstable transmission between the central bank actions and the market reactions. The strategy that worked in the second half of 2002, for example, cannot be thought of as a universal effective recipe for any future turbulent period.

An issue that has been often overlooked by the literature on managed floating is the difficulty in defining clear procedural rules for the foreign exchange interventions. This may be quite important, though, when managed floating is combined with the inflation targeting regime. The lack of clear rules and transparency typically surrounding the foreign exchange interventions contrasts with the clearly defined procedures guiding the interest rate decisions, which may occasionally create some tensions in the monetary policy regime. The Czech experience has been in line with this general conclusion.

Another aspect of the interventions that must not be overlooked is the sterilisation costs. I have shown that these have indeed had a strong empirical relevance in the Czech Republic. Their total sum since 1993 has reached 7-8 % of the yearly GDP, partly as a heritage of the fixed exchange rate regime till May-1997 and partly due to the interventions under floating. In 2002, however, the interest-rate differential vis-à-vis eurozone became negative, which has caused the interventions to be viewed as profitable by the market. This has increased the credibility of interventions, showing that the financial aspects of interventions may be important from the credibility point of view as well.

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