

Holub, Tomáš

Working Paper

Foreign exchange interventions under inflation targeting: the Czech Experience

Research Notes, No. 17

Provided in Cooperation with:

Deutsche Bank Research, Frankfurt am Main

Suggested Citation: Holub, Tomáš (2004) : Foreign exchange interventions under inflation targeting: the Czech Experience, Research Notes, No. 17, Deutsche Bank Research, Frankfurt a. M.

This Version is available at:

<https://hdl.handle.net/10419/21879>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



December 20, 2004

No. 17

Research Notes

Working Paper Series

Foreign exchange interventions under inflation targeting: the Czech Experience

This paper discusses the role of foreign exchange interventions in the inflation-targeting regime, focusing on the Czech experience since 1998. It concludes that the case for foreign exchange interventions is not clear in an inflation targeting regime both from the theoretical and empirical point of view.

First, the stylised facts on the effectiveness of Czech interventions suggest that sometimes these might have had an effect 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. Second, the sterilisation costs of interventions are shown to have been quite substantial in the Czech Republic, which had in certain period affected their credibility and effectiveness. Third and most importantly, the interventions may lead to tensions with the philosophy of the inflation targeting regimes on the procedural and communication level, which might have a negative impact on the credibility of the policy regime.

The paper proposes some criteria for assessing whether the interventions are not in conflict with the inflation targeting regime, and applies these criteria to the Czech case. From an ex post view, all the intervention episodes are judged to be consistent with the inflation targets and output developments, but there may be some doubt in other respects concerning the intervention episodes in early-1998 and late-1999.

Tomáš Holub, Czech National Bank (tomas.holub@cnb.cz)



Advisory Committee

Peter Cornelius
Shell International

Prof. Soumitra Dutta
INSEAD

Prof. Dr. Michael Frenkel
WHU Koblenz

Prof. Dr. Helmut Reisen
OECD Development Centre

Prof. Dr. Norbert Walter
Deutsche Bank Research

Deutsche Bank Research
Frankfurt am Main
Germany
Internet: www.dbresearch.com
E-mail: marketing.dbr@db.com
Fax: +49 69 910-31877

Managing Director
Norbert Walter

FOREIGN EXCHANGE INTERVENTIONS UNDER INFLATION TARGETING: THE CZECH EXPERIENCE

Tomáš Holub*

December 2004

Abstract

This paper discusses the role of foreign exchange interventions in the inflation-targeting regime, focusing on the Czech experience since 1998. It concludes that the case for foreign exchange interventions is not clear in an inflation targeting regime both from the theoretical and empirical point of view. First, the stylised facts on the effectiveness of Czech interventions suggest that sometimes these might have had an effect 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. Second, the sterilisation costs of interventions are shown to have been quite substantial in the Czech Republic, which had in certain period affected their credibility and effectiveness. Third and most importantly, the interventions may lead to tensions with the philosophy of the inflation targeting regimes on the procedural and communication level, which might have a negative impact on the credibility of the policy regime. The paper proposes some criteria for assessing whether the interventions are not in a conflict with the inflation targeting regime, and applies these criteria to the Czech case. From an ex post view, all the intervention episodes are judged to be consistent with the inflation targets and output developments, but there may be some doubt in other respects concerning the intervention episodes in early-1998 and late-1999.

Keywords: Exchange rate, foreign exchange interventions, inflation targeting, sterilisation

JEL Classification: E42, E44, E52, E58, E65, F31

* Tomáš Holub, Czech National Bank (tomas.holub@cnb.cz). This paper presents author's own opinions, which may not correspond to the CNB's policy views. It was originally prepared for a CEPR/Deutsche Bank Research Workshop held in Kronberg, Germany, on 30-31 January 2003. The author to D. Archer, M. Čihák, A. Geršl, M. Hrnčíř, E. Hochreiter, T. Kvapil, L. Niedermayer, P. Siklos and M. Skořepa for useful comments and suggestions. Any remaining errors and omissions are his own.

I. 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 combining it 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 in the ERM II mechanism, in which foreign exchange interventions are likely to gain on importance.

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 II, the current monetary policy framework of the CNB is explained briefly in section III. Section IV describes the exchange rate developments in this regime. Section V presents the major policy steps in the exchange rate management. Section VI summarizes some stylised facts on the effectiveness of the foreign exchange interventions are summarized. Section VII analyses the sterilisation costs of the intervention policies. Finally, the consistency of the interventions with inflation targeting is discussed in Sections VIII and IX. Section X summarises and concludes.

II. Some Theoretical Background

In the past, exchange rate pegs used to be very popular as the anchor 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 than the sterilised ones, if the latter can achieve anything at all (see Rogoff, 1984; Schwartz, 2000).

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 analyses 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 channel (“market microstructure”) literature (see Lyons, 1997; Peires, 1997; Popper and Montgomery, 2001). 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).

In any case, 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.¹ While many countries have in the recent decade or two moved to floating exchange rates, some other economies have adopted currency boards, dollarized/euroized their economies, or formed monetary unions (see Fischer, 2001). On the contrary, the number of countries with intermediate exchange rate regimes (“soft pegs”), which are now viewed as inherently unstable, has declined significantly.

Within the group of those countries that choose, for one reason or another, to pursue independent monetary policy with a large degree of exchange rate flexibility, the inflation targeting has been rapidly 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). As part of this trend, the number of small open economies that operate the inflation targeting regime has grown substantially. For these countries, it is a crucial question what approach should the central bank use to deal with possibly large exchange rate fluctuations under the inflation targeting. Their economies may be quite vulnerable to exchange rate shocks and may thus exhibit a “fear of floating” (Calvo, Reinhart, 2000). We thus need to ask to what extent a central bank pursuing the inflation targeting should use foreign exchange interventions, i.e. whether it should let the exchange rate float freely or try to manage the float to some extent.

The theory of inflation targeting (see e.g. Svensson, 1998; 1999) gives 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.

To be less strict, one may argue that even with the UIP the central bank might be able to affect the current exchange rate with foreign exchange interventions by influencing the market expectations on the future exchange rate path, or by influencing the risk premium. The transmission mechanism between interventions and the exchange rate is, however, 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

¹ 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).

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 and exchange rate channels.

Nevertheless, some recent literature has started to argue in favour of managing the floating exchange rate as part of the inflation targeting regime (Bofinger and Wollmershaeuser, 2001; Goldstein, 2002; Truman, 2003).² Moreover, it is a matter of fact that some of the inflation-targeting countries do use foreign exchange interventions more or less frequently.³ This is in line with a general observation that the de facto practice often differs from the declared exchange rate strategies, typically in the direction of tighter management (Calvo and Reinhart, 2000). There is thus not a general consensus on the “fall of foreign exchange market intervention as a policy tool” (Schwartz, 2000).

Besides the disagreement on whether to use the interventions or not, we also lack generally recognised best practices on the procedural and operational issues for the interventions policies, in spite of some recent attempts to establish these (see Canales-Kriljenko, et al., 2003). This may often create challenges for the central banks that can not resist being occasionally unfaithful to the inflation targeting literature and pure floating.

III. The Czech Republic – Historical Background and Policy Regime

The Czech Republic belongs to the cases that try to combine inflation targeting with a managed float. The aim of this paper is to provide a 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 CNB's monetary policy regime. The Czech situation has some specific characteristics that are useful to understand before moving on to discuss the exchange rate management issues (see also Hrnčič 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.⁴ At that time, the economy and market expectations were destabilised due to the economic overheating of the mid-1990s, currency depreciation after a currency turmoil, 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.

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 flows⁵, gradual – but often not smooth – decline in the risk premium over time, and so on. At the same time, the Czech Republic has a high share of volatile items in its consumer basket,

² 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 Most recently, the Reserve Bank of New Zealand has joined this club.

⁴ 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.

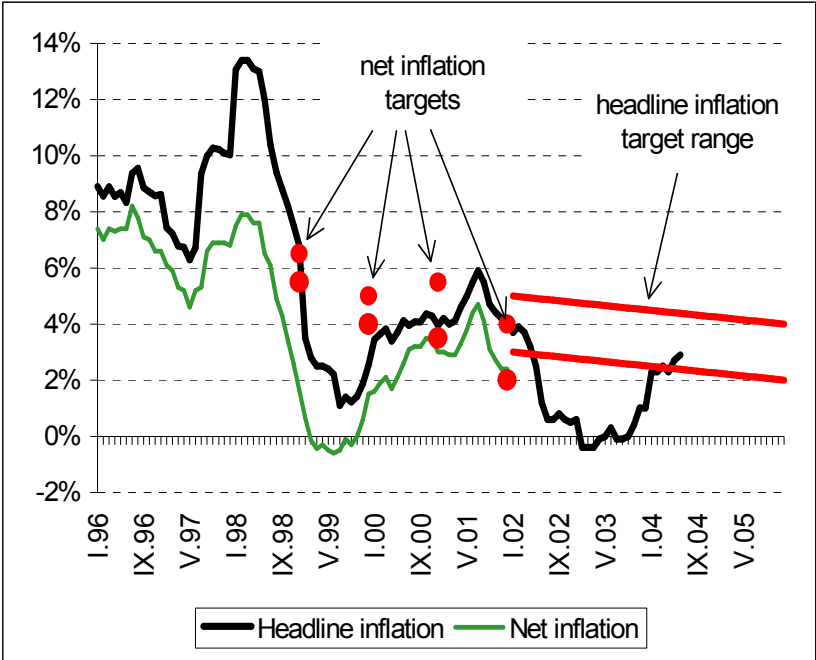
⁵ One can identify two major waves of foreign capital inflows. The first one was primarily driven by short-term capital and took place in 1994-1996. The second one, peaking in 2002, was caused mainly by the FDIs.

implying larger cost-driven shocks to its inflation compared with the advanced countries.⁶ 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 reach 65 % of the GDP (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 1), hitting the target in December 2001 only.⁷ 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 was below the announced target range from mid-2002 till early-2004 (see Figure 1). 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 1: Czech Inflation: Actual vs. Targets



Source: Czech Statistical Office

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. Credibility has been facilitated by a gradual evolution of the regime (longer-term orientation, switch to headline inflation targeting, and so on) in response to the accumulated

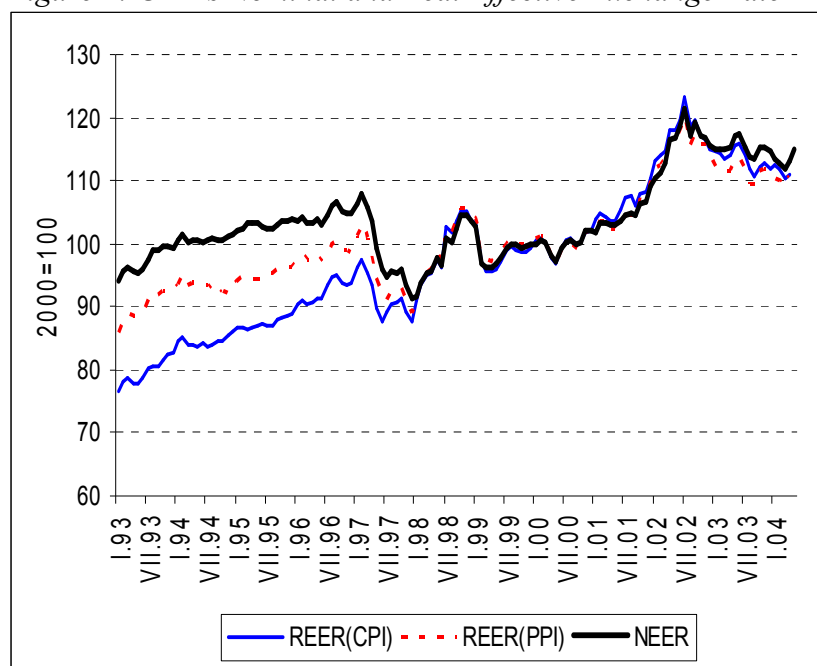
⁶ The share of foodstuffs in the basket is around 28 %, regulated prices 18 % and fuels about 5 %.
⁷ Net inflation is defined as the CPI inflation net of regulated prices and primary impacts of the consumer tax changes.

experience and changing situation. A high degree of transparency, which has been achieved in monetary policy and other areas of the CNB's activities, is crucial for the credibility as well.

IV. Exchange Rate Developments

In this section, I briefly describe the exchange rate developments of the Czech crown (CZK). Figure 2 shows the CZK's monthly nominal and real effective exchange rate, based both on CPI and PPI, since 1993.

Figure 2: CZK's Nominal and Real Effective Exchange Rate



Source: Czech National Bank

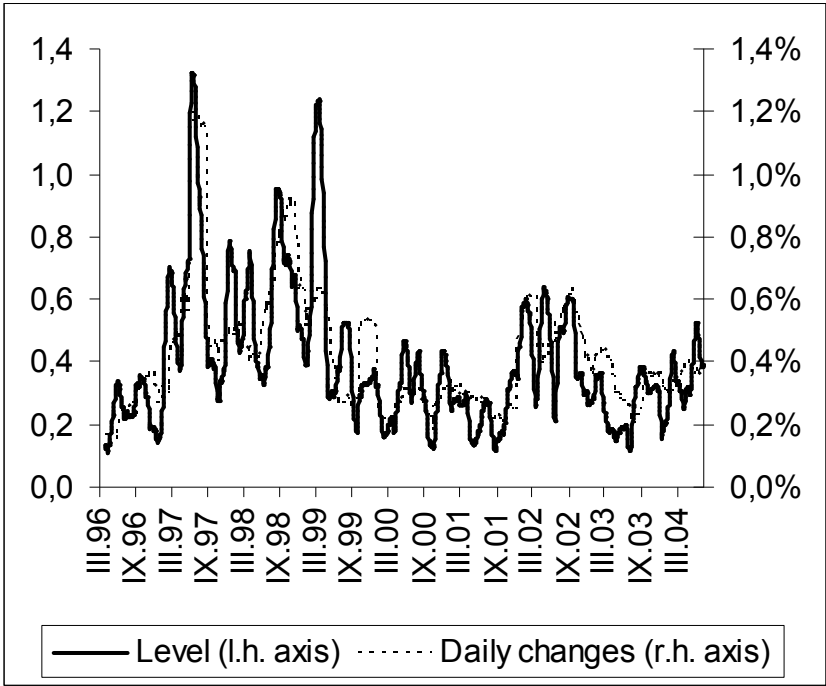
As one can see, the real effective exchange rate has exhibited an appreciating trend over the whole period since 1993 (both in CPI and PPI terms), regardless of the exchange rate regime changes. Before 2001, the real appreciation was mainly driven by an inflation differential, since then it has gone through strengthening of the nominal exchange rate. The appreciating trend might be explained by a combination of several factors, including the Balassa-Samuelson effect, 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). A challenge potentially stemming from this real trend is that it may co-ordinate the exchange rate expectations in one direction, i.e. towards appreciation.⁸ 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. It is moreover difficult to find an appropriate monetary policy response to such developments if the central bank is itself fairly uncertain on what the equilibrium real exchange rate might be.

⁸ 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 2 also shows 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, and more pronounced 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 coincidence that both these two cases were marked with sub-trend economic growth and undershooting of the CNB’s inflation targets (see section III).

The short-term volatility is summarised in Figure 3 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, as expected, greatest in the turbulent year 1997, but was also fairly 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.⁹

Figure 3: Volatility of the CZK/EUR Exchange Rate (60-day standard deviation)



V. Management of the Exchange Rate

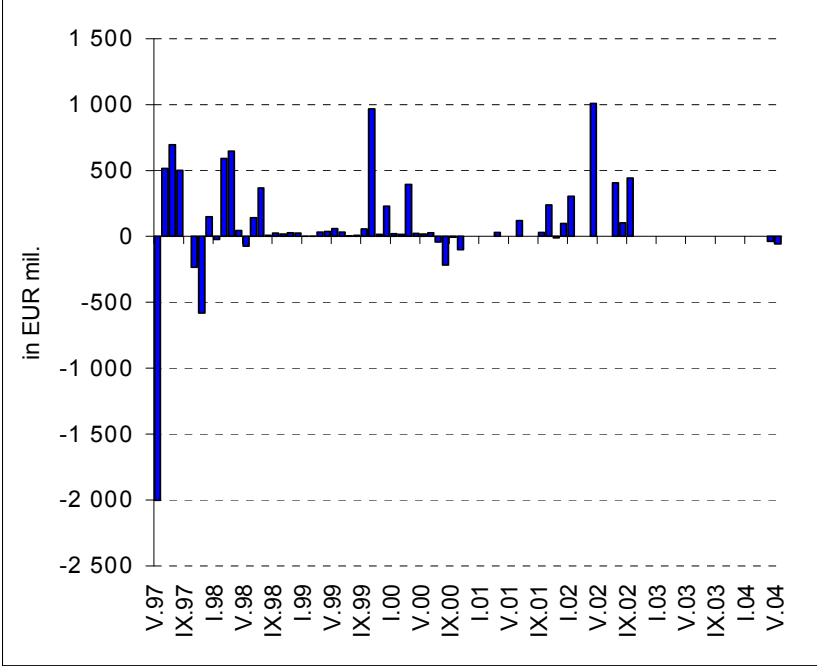
When the floating exchange rate was introduced in May 1997, it was announced that the exchange rate regime would be a managed float, the DEM (EUR at present) serving as a reference currency. The CNB thus retained the possibility to intervene in the foreign exchange market “in the event of excessive volatility or unjustified exchange rate trends”. This section summarizes the CNB’s policy measures responding to the exchange rate developments.

In line with the announced managed floating policy, the CNB intervened occasionally in the foreign exchange market. With the exception of the turbulent year 1997 (which does not

⁹ The short-term volatility of the CZK’s exchange rate is analysed econometrically in Buliř (2003).

belong to the period of inflation targeting), though, the interventions de facto always concerned purchases of foreign exchange to slow down the exchange rate appreciation (see Figure 4).¹⁰ It might be questioned, of course, if this asymmetry in the interventions does not represent a departure from floating exchange rate, signalling that the central bank has been trying to influence the exchange rate trend rather than just respond to volatility, which should go both ways. I address this issue in section VIII.

Figure 4: The Foreign Exchange Interventions (spot)



Source: Czech National Bank

The periods of high intervention activity were typically followed 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 (Figure 2), which peaked above 15 % year-on-year. It also coincided with periods of relatively high short-term volatility of the exchange rate (Figure 3). 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. As a result, there was no strong nominal effective exchange rate appreciation (Figure 2). 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.

¹⁰ In 2004 the CNB has started selling earning on its FX reserves to prevent them from growing further (see the end of data sample in Figure 4). This step, however, has not been intended as a monetary policy measure, but as a balance-sheet adjustment step.

An important aspect of this privatisation account has been facilitating of communication between the CNB and government on the exchange rate issues. 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 in late-2001, the CNB and the government 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 out of privatisation revenues. 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. The Czech nominal interest rates were on a declining trend since the introduction of inflation targeting, with an exception of three minor interest rate hikes so far (by 0.25 % in March 1998, July 2001 and June 2004), 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 went on till mid-2003, thus coinciding with (and extending beyond) the last episode of intervention activity.

VI. Stylised Facts on the 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 (i.e. to know the counterfactual). This is however extremely difficult to do, not least because we lack 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 paper. I thus limit myself to a discussion of some stylised facts. These are summarized in Table 1.

In some cases, the interventions seem to have had a visible immediate impact on the exchange rate. A typical example is March 2000, when interventions of slightly less than EUR 400 million took place. 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 weakening of the CZK was more short-lived (till the beginning of May 1998) in spite of a relatively high volume of interventions. 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, though, the impact was much less clear. For example in June - 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 (even though it may be true that without these interventions the exchange rate might have went on appreciating further).

The immediate impact of the interventions thus looks quite uncertain, but occasionally might last up to 2 or 3 months according to the Czech experience. 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 prevent relatively prolonged periods of exchange rate overvaluation in 1998 or in 2002 (see section IV). 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 an 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.

Table 1: Effectiveness of Foreign Exchange Interventions – Some Stylised Facts¹¹

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

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 2 in section IV), 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 quite strong (unprecedented) and removed the major alleged source of appreciation.¹² The major explanation for the continued strengthening shifted from the privatisation revenues to the long-run real appreciation trend of the Czech crown.

¹¹ 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 roughly equivalent to EUR 75 billion.

¹² 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

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 1), 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 remained relatively weak in 2003 as well. The apparent 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; (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.

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 might 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 judgement on their role in the Czech inflation targeting framework.

On balance, the Czech experience does not shed too much light on the inconclusive debate on the interventions’ effectiveness, and both critics and supporters of the interventions can find their favourite bits in the overall evidence. Nonetheless, it is fair to note that the apparent instability of transmission between the interventions and their outcomes casts a serious doubt on the possibility to use them more systematically as a policy instrument under the inflation targeting regime.

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)

VII. Sterilisation Costs

It is widely accepted that the monetary policy goals must not be subordinated to profit considerations. Nonetheless, when considering the use of foreign exchange interventions, which are supposed to be a complementary policy instrument at best, and are not crucial for achieving the main goal of long-run price stability, the sterilisation costs should be taken into account. This section presents a simple estimate of these costs for the Czech Republic.

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. 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 gradually again due to the occasional interventions from 1998 till early-2000. Since late-2001, the reserves have increased considerably, though, to over EUR 22 billion (CZK 700 billion).

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 almost 3-times. The liquidity is sterilised using reverse repo operations, the volume of sterilisation reaching about CZK 480 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 72 billion at the end of 2003.¹³

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.

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

where i^d denotes the domestic interest rate, i^f foreign interest rate, e percentage exchange rate depreciation, and FXR (net) foreign exchange reserves.¹⁴ Large net foreign exchange reserves mean that the central bank is exposed to exchange rate losses/gains due to exchange rate appreciations/depreciations, making the central bank's profits quite volatile. Another part of the sterilisation costs is given by the interest rate differential between the domestic and foreign interest rates.

Table 2 shows an estimate of the CNB's sterilization costs calculated in line with the above mentioned equation for the period of 1993-2003.¹⁵ 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 pay 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

¹³ 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) or the cost of federation split-up. These transformation costs alone had the same order as the CNB's accumulated loss.

¹⁴ This is a very rough estimate only, as it embodies a very strong ceteris paribus assumption. For example, it ignores the effects of sterilisation policies on the domestic interest rates, macroeconomic developments, fiscal financing costs, etc. For a more detailed discussion of the sterilisation costs, see Holub (2001).

¹⁵ 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.

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 190 billion. In terms of the net present value in 2003, the figure is even higher – around CZK 240 billion, equivalent to 10 % of yearly GDP.

We can thus see that the CNB's sterilisation costs have indeed had a strong empirical relevance, even though the computations presented here are only a rough measure of these costs based on many simplifications (for detail see Holub, 2004). These financial costs of interventions should be taken into account – and compared with the expected macroeconomic benefits – when discussing the exchange rate management, swinging the balance further towards being faithful to the pure floating.

It should be also mentioned that the sterilisation costs may have important implications for the effectiveness of interventions, as the Czech experience illustrates. They may 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).¹⁶ If the financial credibility is low, 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 for the CNB, 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.

Table 2: Estimated "Sterilisation Costs" (CZK billion)

(CZK billion)	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Net foreign assets	24	112	248	342	359	378	439	488	510	630	706
Domestic int. rate (%)	11,1	8,6	10,9	12	14	13,8	6,6	5,3	5,1	3,5	2,2
Foreign int. rate (%)	5,9	4,9	5	4	4	4,1	3,5	5,1	5,5	4,3	2,9
ER gains/losses	-0,3	0	0,2	-8,6	44,7	-35,6	31,8	-3,5	-40,1	-26,2	-29,8
Estimated SC	-1,6	-4,1	-14,5	-36,1	8,6	-72,1	18,5	-4,4	-38,1	-20,9	-25,3

Source: Czech National Bank; own computations

VIII. Consistency of Interventions with Inflation Targeting

The authors who propose supplementing inflation targeting with managed floating typically assume implicitly that this can be done quite easily, without adverse consequences for the credibility of the monetary policy regime. Nonetheless, there is abundant experience showing that trying to “chase two rabbits” with monetary policy can be very harmful for credibility. And this possibility can not be dismissed simply by claiming that this danger does not apply for managed floating in which no exchange rate goal is announced.

¹⁶ Note that this credibility aspect is exactly 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.

There is no generally accepted set of criteria for assessing if the foreign exchange interventions are not in conflict with the inflation-targeting regime (besides the orthodox belief that they are inconsistent with the inflation targeting by definition). I thus propose some simple criteria myself and then assess how the CNB past interventions perform on these. The consistency with the inflation targeting may be assessed on three levels:

- 1) Target consistency: The exchange rate policy should not be in conflict with (or preferably be supportive for) achieving the policy goals of inflation targeting. The supplementary monetary policy tool (i.e. interventions) should not send confusing signals compared with the main one (interest rates). 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). Interventions against appreciation/depreciation are target-consistent only when the inflation forecast points below/above target and/or the output gap is negative/positive. In other words, they should be limited to cases when a monetary easing/tightening is consistent with the inflation targeting.
- 2) Regime consistency: The use of interventions should not be in conflict with the underlying philosophy of inflation targeting. This includes the belief that the central bank can not systematically follow policies that are not consistent with free international capital mobility (the “impossible trinity”). The central bank does not have two independent policy instruments, i.e. it can not choose the mix of monetary conditions at its will. In particular, the foreign exchange interventions should not push against the UIP logic. They should be rather viewed as an attempt to restore the UIP relationship in periods of exchange rate disturbances that are causing inflation target undershooting and macroeconomic instability. On the practical level, this criterion can be assessed by looking at the monetary conditions developments. For interventions against appreciation/depreciation to be regime-consistent the exchange rate should be judged as seriously overvalued/undervalued in comparison with the fundamentals and the interest rate parity, or moving in that direction quickly. At the same time, interest rates should be relaxed/tight and/or declining/rising, reflecting that the primary tool has been used in line with the inflation targeting. As a result, interventions against appreciation/depreciation should be considered mostly in those situations in which the mix of monetary conditions includes a loose/tight interest rate component and tight/loose (and/or quickly appreciating) exchange rate component.
- 3) Procedural consistency: The procedures governing the interventions – such as the decision-making rules, communication to the public, etc. – should be consistent with the constraints imposed on the interest rate decision-making under the inflation targeting.

To make sure, I do not suggest that these criteria should be adhered to rigidly when deciding on the interventions. There may be specific circumstances 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 transition economies) might be a presence of large and volatile privatisation revenues, such as in the Czech Republic. 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 consistency checks altogether. An analogy can be 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.

I am also far from proposing that compliance with these criteria should automatically (or in majority of case) lead to an actual use of interventions. They are rather to be viewed as almost necessary, but not sufficient conditions. 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, low sensitivity of exchange rate to interest rates changes in the particular situation, etc.), expected effectiveness of interventions (market conditions), and sterilisation costs (section VII) should be considered before giving up to one’s temptations to intervene. As a result, the “interventions reaction function” with respect to the variables described in the above consistency criteria is likely to be quite weak and unstable, compared with the interest rate reaction function.

In the rest of this section, I try to apply the first two criteria for assessing the Czech experience since 1998. The procedural issues are left for section IX. 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 3 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).

Table 3: Consistency of Interventions with Inflation Targets and Business Cycle

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 %	-1,8 %	→;↑	?
06/1998	+0.2 %	-4.3 %	-2.3 %	→	? (Y)
07/1998	-0.2 %	-4.3 %	-3.3 %	↓	Y
10/1999	-0.9 %	-1.5 %	-2.9 %	↓	Y
12/1999	-1.4 %	-1.5 %	-2.9 %	↓	Y
03/2000	-1.2 %	-1.5 %	-2.2 %	→	Y
10/2001	+0.3%	-3.2 %	-0.4 %	→	? (Y)
12/2001	-0.5 %	-3.2 %	-0.4 %	↓	Y
01/2002	-0.9 %	-4.1 %	-0.4 %	↓	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 2004 (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.

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 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.¹⁷ 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. Other 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.

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 IV). 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.

In the second step, let us have a look at the developments of the monetary conditions mix to judge the regime consistency of the interventions. In particular, we are asking if the interventions were carried out in periods of lax interest rates and an overvalued exchange rate (or at least in periods when the situation was moving in that direction quickly). The 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 alternative theories to derive the equilibrium trajectories, which may often give contradictory results. For this paper, I use the ex post assessment by the CNB's staff responsible for inflation forecasting from July 2004 (Beneš and N'Diaye, 2003).¹⁸

The exchange rate appears to have been overvalued in two periods: in the last three quarters of 1998 and from late-2001 till early-2003. At the same time, the real interest rate conditions we relaxed in those periods. Therefore, the interventions pass easily the regime consistency criterion in these two instances. For the other periods, the judgement is more uncertain.

In early-1998, the exchange rate was probably close to equilibrium from the ex post view. The real interest rates were still rather high, giving room for easing through the interest rate component of monetary conditions. There are three possible explanations for using the interventions instead in this period. First, the exchange rate equilibrium was assessed differently at that time than at 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 3), but it also liked its mix and tried to prevent it from changing. A preference of restrictive interest rates and depreciated exchange rate could have been motivated by a desire to stabilise the current account after the currency crisis, and to avoid a spill-over of capital flows volatility from the emerging market crises (see also Holub and Tůma, 2001). In other words, the policy may have followed the goal of

¹⁷ 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.

¹⁸ This expert assessment, however, should not to be interpreted as an official policy view of the CNB.

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.

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. A possible ex-ante motivation for the decision to intervene can be found in the minutes of the Bank Board meeting of October 4, 1999, which suggest 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 the "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 these arguments into account, the judgement of the interventions' ex ante consistency might perhaps be more positive than the ex post assessment.¹⁹

IX. Procedural Issues

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. An open question, which the literature on managed floating has not addressed 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 rather vague, compared with other policy areas. On the one hand it is argued in favour of clarity on the mandate, rules and procedures for the authorities carrying out 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

¹⁹ Personally, though, I can still see some open questions here. 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.

information on foreign exchange operations” (IMF, 1999; see also Chiu, 2003). The international practice is also quite diverse, and there are considerable differences in the disclosure policy even among countries practising the same exchange rate regime (Chiu, 2003). The same is true even if one looks on the subset of inflation targeting central banks.

The lack of clear procedures 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.²⁰ Nevertheless, the rules have typically 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”.

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 II), 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 lack of transparency and other operational rules may be also justified by the fundamental difference in the central banks’ position in the foreign exchange market compared with the domestic 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. A central bank can 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 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, as this could weaken their signalling effect. Publishing the voting ratios or dissenting views in the real-time thus might be damaging.²¹

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 4), 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 some regular meetings (e.g. 4th October 1999, 30th March 2000, and 25th October 2001). But information on the voting ratio was given

²⁰ The Sveriges Riksbank (2002) has been one of the leaders in this respect. 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.

²¹ It might still be possible and advisable, though, to publish the Board discussions with rather a long time lag for the sake of accountability.

only in some of those cases when the decision was unanimous.²² 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 4: Communication of the Interventions

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. 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 step further 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 a list of escape clauses), no such clear 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

²² 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, the transcripts are produced from those meetings only at which interest rate changes are discussed.

interventions consistent with the current policy regime.²³ In contrast with the Situational Reports 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 very open economies, however, it is not clear whether the central banks can afford to do this just due to procedural consistency and related 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. (see above). 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).

²³ 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.

V. 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, proposing that small open economies can successfully combine the inflation targeting with managed floating.

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 out of the privatisation revenues. 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.

The stylised facts do not give any clear answer concerning the effectiveness of the interventions. It seems that sometimes they might have had an immediate impact, lasting 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 prevent quite prolonged periods of exchange rate overvaluation in 1998 and in 2002. 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, one could say that they had a medium-term impact on the exchange rate. In sum, the experience so far seems to favour a signalling role of foreign exchange interventions, which 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 important 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 8-10 % 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. The sterilisation costs had a negative impact on the interventions' credibility and effectiveness till 2002, when the interest-rate differential vis-à-vis eurozone became negative and the interventions started to be viewed as profitable by the market.

To judge whether the foreign exchange interventions are not in a strong conflict with the inflation targeting regime, I propose three basic criteria, which look at the consistency of the interventions with the inflation targets (target consistency), at the mix of monetary conditions (regime consistency) and the clarity and transparency of decision making (procedural transparency). In my opinion, central banks that want to use foreign exchange interventions as part of the inflation targeting regime should define and communicate such criteria of their target and regime consistency, even if these criteria should be used as “flexible rules” for the interventions allowing for possible escape clauses. It also needs to be stressed that the criteria must be viewed as necessary, but not sufficient conditions for the actual use of interventions.

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 from late-2001 till 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.

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 tensions in the monetary policy regime. The Czech experience has been in line with this general conclusion.

References

- Beneš, J., Hlédik, T., Vávra, D., Vlček, J. (2003) *The Quarterly Projection Model and its Properties*. In: Coats, W., Laxton, D., Rose, D. (eds.), "The Czech National Bank's Forecasting and Policy Analysis System", Prague, Czech National Bank, 2003.
- Beneš, J., N'Diaye, P. (2003) *A Multivariate Filter for Measuring Output and the NAIRU*. In: Coats, W., Laxton, D., Rose, D. (eds.), "The Czech National Bank's Forecasting and Policy Analysis System", Prague, Czech National Bank, 2003.
- Bofinger, P., Wollmershaeuser, T. (2001) *Managed Floating: Understanding the New International Monetary Order*. London, CEPR Discussion Paper no. 3064.
- Branson, W.H. (1976) *Asset Markets and Relative prices in Exchange Rate Determination*. Stockholm, Institute for International Economic Studies, Seminar Paper No. 66.
- Buliř, A. (2003) *Some Exchange Rates Are More Stable than Others: Short-Run Evidence from Transition Countries*. Prague: CNB Working Paper Series, no. 5/2003.
- Calvo, G. A., Reinhart, C. M. (2000) *Fear of Floating*. Cambridge, MA, NBER Working Paper, no. 7993.
- Canales-Kriljenko (2003) *Foreign Exchange Intervention in Developing and Transition Economies: Results of a Survey*. Washington, D.C., IMF Working Paper, WP/03/95 (May).
- Canales-Kriljenko, J. I., Guimarães, R., Karacadağ (2003) *Official Intervention in the Foreign Exchange Market: Elements of Best Practice*. Washington, D.C., IMF Working Paper, WP/03/152 (July).
- Chiu, P. (2003) *Transparency versus Constructive Ambiguity in Foreign Exchange Intervention*. BIS Working Papers, No. 144 (October).
- Čihák, M., Holub, T. (2003) *Price Convergence to the EU: What Do the 1999 ICP Data Tell Us?* Prague: CNB Working Paper Series, no. 2/2003.
- Derviz, A. (2003) *Components of the Czech Koruna Risk Premium in a Multiple-Dealer FX Market*. Prague: CNB Working Paper Series, no. 4/2003.
- Dominguez, K. M., Frankel, J. A. (1993) *Does Foreign Exchange Intervention Matter? The Portfolio Effect*. American Economic Review, vol. 83 (December), pp. 1356-1369.
- Edison, H. J. (1993): *The Effectiveness of Central Bank Intervention: A Survey of the Literature after 1982*. Special papers in International Economics No. 18, Princeton University, Princeton.
- Fischer, S. (2001) *Exchange Rate Regimes: Is the Bipolar View Correct?* A Lecture Delivered at the Meetings of the American Economic Association, New Orleans, January 6 (<http://www.imf.org/external/np/speeches/2001/010601a.pdf>).
- Goldstein, M. (2002) *Managed Floating Plus*. Washington, D.C., Institute for International Economics, Policy Analyses in International Economics, No. 66.
- Halpern, L., Wyplosz, C. (2001) *Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection*. In Economic Survey of Europe 1, Geneva: UN Economic Commission for Europe, Chapter 6: p. 227–240.
- Holub, T., Tůma, Z. (2001) *Managing Capital Inflows in the Czech Republic: Experiences, Problems and Questions*. Paper prepared as part of the project "Managing Capital Flows in the Transition Economies of Central and Eastern Europe", Budapest: ICEG European Centre.

- Holub, T. (2001) *Račebné a financování centrální banky*. Finance a úvěr, vol. 51, no. 1/2001, pp. 9-32.
- Holub, T. (2004) *Foreign Exchange Interventions under Inflation Targeting*. Prague: CNB, Internal Research and Policy Note, 1/2004 (http://www.cnb.cz/en/pdf/IRPN_1_2004.pdf).
- Hrnčíř, M., Šmídková, K. (1998) *The Czech Approach to Inflation Targeting*. Prague: CNB, Workshop on Inflation Targeting, proceedings of a conference held on September 14-15.
- IMF (1999) *Code of Good Practices on Transparency in Monetary and Financial Policies*. Washington, D.C, International Monetary Fund (
- Kearns, J., Rigobon, R. (2002) *Identifying the Efficacy of Central Bank Interventions: the Australian Case*. NBER Working Paper, no. 9062 (July).
- Kouri, P. J. K. (1976) *The Exchange Rate and the Balance of Payments in the Short Run and in the Long Run: A Monetary Approach*. Scandinavian Journal of Economics, vol. 78, pp. 280-304.
- Lyons, R. K. (1997) *A simultaneous trade model of the foreign exchange hot potato*. Journal of International Economics, vol. 42, p. 275–298.
- Mahadeva, L., Sterne, G. (2000) *Monetary Policy Frameworks in a Global Context*. London: Routledge and Bank of England.
- Mussa, M. (1981): *The Role of Official Intervention*. Occasional Paper No 6, Group of Thirty, New York.
- Popper, H., Montgomery, J. D. (2001) *Information Sharing and Central Bank Intervention in the Foreign Exchange Market*. Journal of International Economics, vol. 55, pp. 295-316.
- Rogoff, K. (1984) *On the Effects of Sterilized Intervention: An Analysis of Weekly Data*. Journal of Monetary Economics, vol. 14 (September), p. 133-150.
- Sarno, L., Taylor, M. P. (2001) *Official intervention in the foreign exchange market: Is it effective and, if so, how does it work?* Journal of Economic Literature, vol. 39, iss. 3 (September), p. 839-868.
- Schwartz, A. J. (2000) *The Rise and Fall of Foreign Exchange Market Intervention*. Cambridge, MA, NBER Working Paper, No. 7751 (June).
- Svensson, L. E. O. (1998) *Open-Economy Inflation Targeting*. London, CEPR Discussion Paper No. 1989 (October).
- Svensson, L. E. O. (1999) *Inflation Targeting as a Monetary Policy Rule*. Journal of Monetary Economics, vol. 43, pp. 607–654.
- Svensson, L. E. O. (2001) *Independent Review of the Operation of Monetary Policy in New Zealand: Report to the Minister of Finance*. Reserve Bank of New Zealand.
- Sveriges Riksbank (2002) *The Riksbank's interventions in the foreign exchange market – preparations, decision-making and communication*. Stockholm, 31 January 2002 (<http://www.riksbank.se/>).
- Truman, E. M. (2003) *Inflation Targeting in the World Economy*. Washington, D.C., Institute for International Economics.
- Williamson, J. (2000) *Exchange Rate Regimes for Emerging Markets: Reviving the Intermediate Option*. Washington, D.C., Institute for International Economics, Policy Analyses in International Economics, No. 60.

© 2004. Publisher: Deutsche Bank AG, DB Research, D-60262 Frankfurt am Main, Federal Republic of Germany, editor and publisher, all rights reserved. When quoting please cite "Deutsche Bank Research".

The information contained in this publication is derived from carefully selected public sources we believe are reasonable. We do not guarantee its accuracy or completeness, and nothing in this report shall be construed to be a representation of such a guarantee. Any opinions expressed reflect the current judgement of the author, and do not necessarily reflect the opinion of Deutsche Bank AG or any of its subsidiaries and affiliates. The opinions presented are subject to change without notice. Neither Deutsche Bank AG nor its subsidiaries/affiliates accept any responsibility for liabilities arising from use of this document or its contents. Deutsche Banc Alex Brown Inc. has accepted responsibility for the distribution of this report in the United States under applicable requirements. Deutsche Bank AG London being regulated by the Securities and Futures Authority for the content of its investment banking business in the United Kingdom, and being a member of the London Stock Exchange, has, as designated, accepted responsibility for the distribution of this report in the United Kingdom under applicable requirements. Deutsche Bank AG, Sydney branch, has accepted responsibility for the distribution of this report in Australia under applicable requirements.

Printed by: HST Offsetdruck Schadt & Tetzlaff GbR, Dieburg

ISSN Print: 1610-1502 / ISSN Internet: 1610-1499 / ISSN e-mail: 1610-1480