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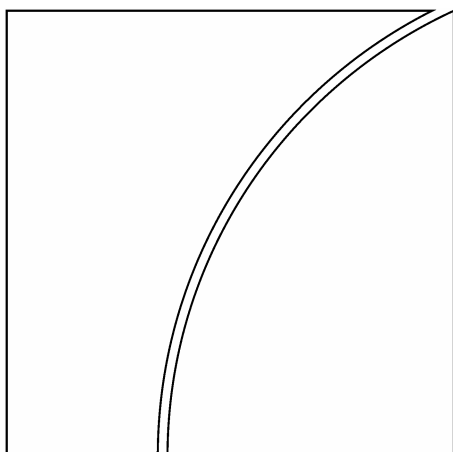
BIS Papers

No 24

Foreign exchange market
intervention in emerging
markets: motives, techniques
and implications

Monetary and Economic Department

May 2005



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Contents

Participants in the meeting	iii
 BIS background papers	
Foreign exchange market intervention in emerging market economies: an overview	1
Motives for intervention Ramon Moreno	4
Governance aspects of foreign exchange interventions Paul Moser-Boehm	19
Foreign exchange market intervention: methods and tactics David Archer	40
Intervention: what are the domestic consequences? M S Mohanty and Philip Turner	56
Survey of central banks' views on effects of intervention Dubravko Mihaljek	82
The effectiveness of foreign exchange intervention in emerging market countries Piti Disyatat and Gabriele Galati	97
 Contributed papers	
Foreign exchange intervention in Argentina: motives, techniques and implications Claudio Irigoyen	114
Provision of FX hedge by the public sector: the Brazilian experience Afonso Bevilaqua and Rodrigo Azevedo	119
Flexible exchange rate regime and forex intervention José De Gregorio and Andrea Tokman R	127
Foreign exchange market intervention in Colombia José Darío Uribe and Jorge Toro	139
Forex interventions: the Czech experience Tomáš Holub	150
Foreign exchange market operations: the recent experience of Hong Kong Peter Pang	162
Defending the strong side of the band: the Hungarian experience Zsolt Érsek	171
Foreign exchange intervention and policy: Bank Indonesia experiences Bank Indonesia	177
Approaching a decade of no foreign exchange intervention - lessons from Israel Meir Sokoler	188
Foreign exchange intervention and foreign exchange market development in Korea Gwang-Ju Rhee and Eun Mo Lee	196
Central banking intervention under a floating exchange rate regime: ten years of Mexican experience José Julián Sidaoui	209
The Reserve Bank of New Zealand's new foreign exchange intervention policy Kelly Eckhold and Chris Hunt	231

Forex interventions in Peru: 2002-2004 Adrián Armas	242
Exchange rate policy and foreign exchange interventions in Poland Jerzy Pruski and Piotr Szpunar	255
Foreign exchange intervention in Saudi Arabia Muhammad Al-Jasser and Ahmed Banafe	265
South Africa: official foreign exchange operations South African Reserve Bank	273
Foreign exchange policy and intervention in Thailand Financial Markets Operations Group, Bank of Thailand.....	276
Monetary and exchange rate policies in the post-crisis period in Turkey Fatih Özatay	283
Foreign exchange intervention in Venezuela Iván Giner and Omar Mendoza	292
Previous volumes from Deputy Governors' Meetings.....	301

Foreign exchange market intervention in emerging market economies: an overview

On 2 and 3 December 2004, the BIS hosted a meeting of Deputy Governors of central banks from major emerging market economies to discuss foreign exchange market intervention. While few developed countries have actively intervened within the last decade, the outstanding exception being Japan, intervention has been commonplace in the emerging market community.

There are several reasons why developed countries no longer actively intervene. One is that research and experience suggest that the instrument is only effective (at least beyond the very short term) if seen as foreshadowing interest rate or other policy adjustments. Without a durable and independent impact on the nominal exchange rate, intervention is seen as having no lasting power to influence the real exchange rate and thus competitive conditions for the tradable sector. A second reason is that large-scale intervention can undermine the stance of monetary policy. A third reason is that private financial markets have enough capacity to absorb and manage shocks - so that there is no need to "guide" the exchange rate.

Yet emerging market countries do intervene - presumably because they believe the instrument to be an effective tool in the circumstances and for the situations they face. The difference in view is brought home by the unprecedented scale of foreign exchange reserve accumulation by the emerging market group in recent years. Between the end of 2001 and the end of 2004, global foreign exchange reserves grew by over US\$ 1600 billion, reflecting reserve accumulation by emerging market economies in Asia. Many observers from developed economies have publicly attributed the comparatively weak appreciation of Asian currencies against a rapidly depreciating US dollar to such intervention. Hence there does seem to be a common belief that intervention by emerging market economies has significantly altered the path of the *real* exchange rate for long enough to matter - even if such a view runs counter to received wisdom about intervention in the markets for major currencies.

This meeting threw some new light on these issues. Some flavour of the discussion can be gleaned from the central bank papers reproduced in this volume, along with overview papers prepared by BIS staff. Four central questions are outlined below; it will be clear that many important issues remain to be resolved.

Is intervention more effective in emerging markets?

The wide range of different objectives behind intervention in practice makes assessment difficult - especially empirical assessment that uses data from different episodes and different countries where policy objectives may vary. In flexible exchange rate cases, the objectives of intervention are particularly varied, a point which emerges clearly from the Moreno paper and the individual country papers in this volume. Reasons for intervention cited by central banks that do not target the exchange rate include: to slow the rate of change of the exchange rate; to dampen exchange rate volatility (in some cases to satisfy an inflation target); to supply liquidity to the forex market; or to influence the level of foreign reserves. The paper from South Africa provides an example of objectives that are both subsidiary to the main objective and conditional on prevailing circumstances (in this case, the process of reserve accumulation being used to help dampen volatility when that is convenient). Other country papers show that varying mixtures of objectives are quite commonplace.

Many central banks would argue that their main aim is to limit exchange rate *volatility* rather than to meet a specific target for the *level* of the exchange rate. Yet others would counter that it is better to abstain from intervention in the foreign exchange market: such a stance would, they contend, make investors more aware of the need to hedge their own exposures, and this would help the market in hedging instruments to develop. The papers from Israel, Mexico, Poland and Thailand are particularly relevant in this regard. There is indeed some evidence that exchange rate volatility has fallen a lot in some countries where the central bank has not intervened in recent years. The papers from Korea and Peru highlight the existence of a policy trade-off where there are reasons to intervene to dampen volatility yet intervention may involve moral hazard with respect to market development.

The survey reported in Mihaljek's paper shows that many emerging market central banks view intervention as effective in influencing the exchange rate consistent with their objectives. Part of this may be attributable to cases in which fixed or targeted exchange rate regimes are in place: under such

a regime, monetary policy actions are primarily dictated by what is needed to achieve and maintain the exchange rate target, intervention in the foreign exchange market is automatic or nearly so, and the exchange rate peg has proved reasonably durable. The papers from Hong Kong SAR and Saudi Arabia illustrate the point.

Formal econometric research has usually thrown doubt on the conclusion of effectiveness of intervention in flexible exchange rate cases although, as noted, such research often conflates interventions for different purposes. In addition, the effectiveness of intervention is likely to depend on the specific circumstances - studies of effectiveness on average do not answer the question of when intervention is likely to be successful.

Disyatat and Galati's paper surveys the available empirical evidence, and presents new evidence for the Czech koruna (the methodology requires detailed daily data on intervention and option prices, which were only available for the Czech Republic). The authors' new estimates tentatively suggest the existence of a cumulative effect from repeated intervention (although the mechanism is not clear). In the group of countries surveyed, there are several examples of repeated interventions over lengthy periods. In this connection, the paper from Venezuela makes the interesting point that intervention might have diminishing power with repetition.

It remains possible that greater apparent effectiveness of intervention in emerging market cases simply reflects different structural characteristics. Emerging market economies tend to have less substitutability of assets across currency boundaries, and the authorities tend to have greater financial - and certainly regulatory - weight relative to their private markets. Mihaljek's paper shows clearly that emerging market economies typically hold very large reserves compared with market turnover (see Table A2), even if interventions are not in general large relative to turnover. And several of the country papers describe the application of regulatory measures to obtain influence over the exchange rate.

How much transparency is desirable in forex intervention?

Typically, exchange rate and intervention policy involves some consultation between the government and the central bank. But there is no simple rule for allocating responsibilities between these two entities. As the paper by Moser-Boehm makes clear, views of central banks also differ about transparency. Transparency is seen as needed for accountability, which is more important the more autonomous the central bank. In some cases, high levels of transparency have also been used as a means of reinforcing a break from past exchange rate regimes and as part of an attempt to rebuild credibility. The papers from Argentina, Chile and Turkey all make such a point.

Many favour transparency regarding the intervention framework *ex ante*, and transparency about actual intervention operations *ex post*. For tactical reasons, however, silence regarding the timing and precise nature and size of specific operations *ex ante* is generally thought to be desirable (one exception is Hong Kong, where operations are revealed in real time). Intervention is sometimes kept secret so that the market has no target to attack - the paper from Hungary provides an account of open interventions attracting destabilising speculation - or has no idea of how much intervention has taken place so that credibility is not threatened by the perception that the central bank has failed. Some argue that markets eventually find out and secret intervention of this type is undesirable.

Have intervention tactics improved?

Central banks have probably improved their intervention techniques in recent years. They now devote greater resources to "reading" the market than in the past. But it is unclear whether central banks have become more effective as a result, because the sophistication of market participants has also risen and because the knowledge of what drives the exchange rate is still very imperfect. The paper by Archer examines tactical issues in some depth.

The outcome of various intervention tactics depends on the situation, and tactics evolve as part of an ongoing trial-and-error process reflecting uncertainty about what works. Few felt that "clever" use of market dynamics (eg entering the market when it is known to be illiquid) to leverage the influence of interventions would be useful in practice. Most have an aversion to volatility, and would not like to add to it. Some would not like to be visible in the market at all, and the central bank's presence is harder to hide when operating in thin markets. Others felt that having a large effect in a peripheral part of the market would be unlikely to generate useful results in the main (spot, wholesale, onshore) market. In

any case, if a central bank wants to be effective in the main market, it should intervene in that market for reasons of credibility.

The idea that intervention might work by “coordinating” otherwise dispersed or fragile views about the exchange rate outlook is also discussed in the paper by Archer. If that coordination channel is operating, it seems likely that actions rather than words are the main coordinating vehicle, given that only a small minority of participating central banks reported actively using “open mouth operations”. However, the papers from Chile and Indonesia provide interesting counter-examples where open mouth operations of quite different forms have been seen to be successful in influencing exchange rate behaviour.

How decisive are adverse domestic spillovers?

Resisting currency appreciation through large-scale and prolonged sterilised intervention creates several major challenges - for the stance of monetary policy; for the financing costs of the authorities; and for exposures in both financial markets and the public sector’s balance sheet. Possible adverse spillovers are addressed in the paper by Mohanty and Turner and by a number of the contributed papers (see especially the discussions of the relationship between foreign exchange market intervention and inflation targeting in the papers from Brazil, Colombia, the Czech Republic and New Zealand).

Such domestic spillovers seem likely to make intervention harder and harder to sustain. Seeking to *both* prevent currency appreciation *and* hold up domestic money market rates (for monetary policy reasons) perpetuates the initial interest rate differential and can lead to continuous capital inflows. There is a risk of significant balance sheet mismatches for central banks, which could face losses due to carrying costs (if local interest rates were above foreign levels) or to their exposure to large currency appreciation. But although the factors that could at some point undermine the sustainability of intervention are clear, there are few signs at present that these adverse consequences have actually materialised.

A number of features of the current situation thus seem new, with interesting implications. Large-scale sterilisation operations are clearly much less hampered by financial market underdevelopment than was the case just a few years ago. And even with incomplete sterilisation, the relative lack of adverse consequences raises the distinct possibility of longer-lasting real exchange rate effects of intervention than conventional wisdom thought likely. Just how long-lasting such effects really are cannot be known until the present episode has run its course.

Motives for intervention

Ramon Moreno¹

I. Introduction

Central banks intervene in foreign exchange markets in order to achieve a variety of overall economic objectives, such as controlling inflation, maintaining competitiveness or maintaining financial stability. The precise objectives of policy and how they are reflected in foreign exchange market intervention depend on a number of factors, including the stage of a country's development, the degree of financial market development and integration, and a country's overall vulnerability to shocks. The precise definition of which operations in forex markets constitute "intervention" has also been a matter of controversy.²

Three immediate objectives of intervention have been important: to influence the level of the exchange rate; to dampen exchange rate volatility or supply liquidity to foreign exchange markets; and to influence the amount of foreign reserves. Much of the analysis in this paper draws on central bank responses to a questionnaire on foreign exchange market intervention and meetings with central bank officials and foreign exchange market participants.

II. Motives for intervention

Table 1 proposes a taxonomy of intervention that will be used to organise the discussion. Foreign exchange market intervention is driven by broad macroeconomic objectives shown in the column headers: to control inflation or maintain internal balance; to maintain external balance and prevent resource misallocation or preserve competitiveness and boost growth; and to prevent or deal with disorderly markets or crises. To achieve these objectives, central banks might seek to target the level of the exchange rate, dampen exchange rate volatility or influence the amount of foreign reserves.

The economic objectives of intervention will influence its targets, the indicators monitored and the tactics. For example, under a floating exchange rate regime, if the concern is with inflation, the estimated pass-through from exchange rate changes to inflation is relevant, and the behaviour of the nominal exchange rate will be monitored with a view to preventing sharp changes (ie dampening volatility). If external balance is the primary concern, the real exchange rate and the current account, and factors that may influence these variables, such as the terms of trade or capital flows, will be monitored. If the concern is with financial stability and crisis prevention, then market conditions (some cited in Rhee's paper on Korea in this volume) can be highly informative, including: how fast the exchange rate changes; the size of exchange rate volatility; bid-ask spreads; transaction volumes; and the exposure of different market participants. Determinants of the nominal exchange rate, such as portfolio flows or forward market transactions, would also be closely watched. Tactics - and the approach to intervention (leaning against the wind, dampening overshooting, etc) - may be heavily influenced by these same market conditions or by other indicators. Over a longer time horizon, in gauging the appropriate level of reserves needed for purposes of intervention, an assessment of whether capital flows are temporary or permanent can be helpful.

¹ Valuable comments by David Archer, Philip Turner and William White are gratefully acknowledged.

² This issue is reviewed in Annex 1.

Table 1

Taxonomy of foreign exchange market intervention

	Macroeconomic objectives		
	Control inflation and internal balance	External balance, growth, efficient resource allocation	Maintain financial stability (Prevent disorderly markets or crises)
Specific intervention objectives			
A. Influence the exchange rate level (pegs, bands, crawls, announced or unannounced)	X	X	X
B. Dampen volatility under floating	X	X	X
i. Respond to volatility symmetrically			X
ii. Prevent excessive movements or overshooting (no fixed target)	X	X	X
iii. Resist too rapid movements	X	X	X
iv. Maintain liquidity in foreign exchange markets			X
C. Influence the amount of foreign reserves			X

In his paper on the Czech experience for this volume, Holub makes the important point that procedural rules for foreign exchange intervention under managed floating with inflation targeting are difficult to define, in contrast to clearly defined procedures for adjusting interest rates. To the extent that such rules exist, they are seldom revealed, complicating the analysis of motives for intervention.

A. Intervention to influence the level of the exchange rate

In the early 1990s, many emerging market economies maintained (de facto or de jure) pegged or managed exchange rate regimes, which were intended to target the level of the exchange rate or limit fluctuations within a band. These arrangements were supported by monetary policy and exchange market intervention. In some cases, such as Hong Kong, Argentina, the Baltic states and Bulgaria, foreign exchange operations would support a peg under a currency board arrangement. Several economies in East Asia (eg Malaysia and Thailand) maintained basket pegs which closely resembled pegs to the dollar. Crawling (depreciating) bands were a feature of pegged exchange rates in Mexico and Indonesia before their respective crises in 1994 and 1997. However, exchange rate pressures could go in either direction: Chile, Israel and Singapore have experienced appreciation pressures within their bands over certain periods. Even countries with officially more flexible regimes limited exchange rate movements: under Korea's "market average exchange rate system" adopted in 1990, daily exchange rate movements were limited within certain bands.³ Many pegged exchange rate

³ Goldstein (2002) provides an overview of different approaches to pegging in the 1990s.

arrangements collapsed after the Asian and Russian crises of 1997-98. However, there are important exceptions: pegs have been maintained in China and Hong Kong while Malaysia reverted to a fixed rate in 1998.

Why does the official sector target the exchange rate? Three reasons may be cited. First, to control inflation or maintain internal balance. Some countries have controlled inflation by using the exchange rate as a nominal anchor for monetary policy. For example, the adoption of Argentina's currency board and of Brazil's quasi-fixed exchange rate regime in the early 1990s ended periods of very high inflation in these economies. The use of the exchange rate as a nominal anchor has declined, but the issue remains important for China as it considers approaches to liberalising its exchange rate regime. Other countries (eg Chile, Israel and Singapore) have controlled inflation by using an exchange rate path (announced or unannounced) as an indirect or operational target to control inflation, or in support of monetary policy. The exchange rate was not necessarily the nominal anchor as these policies were implemented to support inflation targets.

Second, to achieve external balance or enhance competitiveness and boost growth. Exchange rate targets have been used to prevent real exchange rate misalignment and achieve external equilibrium (eg in Korea until 1997). Often, a goal has been to prevent real exchange rate appreciation and large current account deficits that can be perceived as unsustainable and suddenly reverse.⁴ As discussed below, others may have set exchange rates to enhance competitiveness.

Third, to prevent crises. If there are significant currency mismatches in the economy so that foreign currency liabilities are not fully backed by foreign currency assets or earnings, a currency depreciation can adversely affect the financial position of financial institutions or firms that borrow in foreign currency. A sufficiently large depreciation could weaken the financial sector or even trigger a financial crisis under these conditions.

A number of issues arise from these experiences.

First, what roles should exchange rate intervention and interest rate adjustment play in implementing monetary and exchange rate policy? For a time, Israel relied exclusively on foreign exchange market intervention to maintain a pegged exchange rate. It then switched to an interest rate instrument to achieve an inflation target while relying on foreign exchange intervention to keep the exchange rate on target (however, it has not intervened since 1997). Hong Kong has resorted to unsterilised intervention in the foreign exchange market under its currency board-style arrangement (see Sokoler's paper on Israel and Pang's paper on Hong Kong in this volume, Gerlach et al (2004)).

Second, what exchange rate level should be targeted? There are differing views on this. The traditional view is that the exchange rate level should be set so as to achieve external balance. However, exchange rate determination models are poor and criteria for judging external balance vary, so there can be disagreements on the extent to which the exchange rate might be misaligned.⁵ Others use purchasing power parity (PPP) as the criterion for equilibrium, but estimates can also vary considerably. In some countries, deviations from PPP appear to persist for extended periods.⁶ Still others argue that exchange rate policy should pursue development goals. In this view, some Asian countries have targeted the dollar and kept currencies undervalued in an effort to maintain external competitiveness, attract foreign direct investment and boost exports and growth (Dooley et al (2003, 2004a)). The resulting accumulation of foreign reserves could be seen as collateral to attract foreign investors (Dooley et al (2004b)). From this perspective, low returns or even losses on such reserves would not necessarily be a concern given the growth and development benefits. In line with this, Graph 1 shows that real exchange rates for many emerging market economies do not show a

⁴ Current account deficits have recently turned to surpluses in a number of emerging market economies, but intervention to resist appreciation has continued in some cases. In other cases, questionnaire responses indicate that central banks monitor behaviour of the real exchange rate and the current account, even if they do not use these as criteria for intervention.

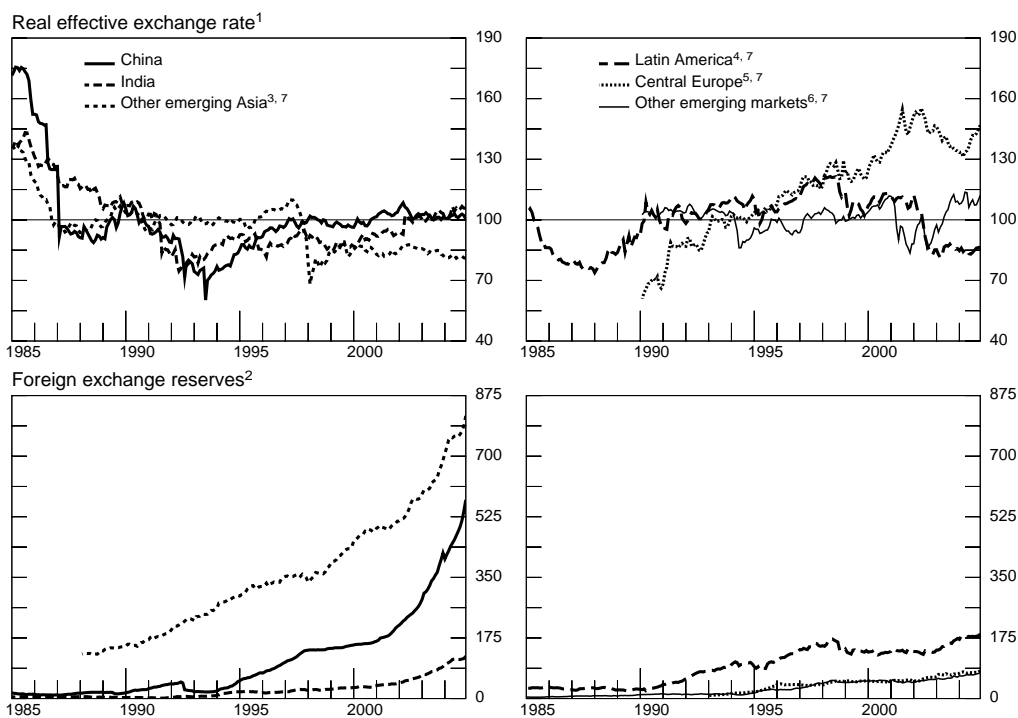
⁵ In contrast, Goldstein (2004) argues that the balance of payments surplus in China reveals significant exchange rate misalignment and the need for a significant appreciation in the exchange rate.

⁶ PPP estimates suggest that the nominal exchange rates are undervalued in a number of Asian economies. However, these estimates vary widely; in China they range from estimated undervaluation by a factor of 4 to undervaluation of 40%. Also, deviations from purchasing power parity in Asian economies appear to be more persistent than suggested by empirical studies indicating convergence to PPP in about four or five years (Frankel and Rose (1996)).

tendency towards appreciation in the medium run, which might have been expected given the rapid expansion in tradable goods capacity and, in many cases, significant balance of payments surpluses. Also, foreign reserves have risen very sharply as a result of heavy intervention in China and other emerging Asian economies.

Graph 1

Real exchange rates and foreign exchange reserves



¹ 1985-99 = 100; in terms of relative consumer prices. An increase indicates an appreciation. ² In billions of US dollars. ³ Hong Kong SAR, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan (China) and Thailand. ⁴ Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. ⁵ The Czech Republic, Hungary and Poland. ⁶ Israel, South Africa and Turkey. ⁷ For foreign exchange reserves, sum of the economies listed; for others, weighted average of the economies listed based on 2000 GDP and PPP exchange rates.

Sources: IMF; national data; BIS calculations.

For other emerging Asian economies, the gains from targeting the exchange rate no longer appear to be as clear-cut as suggested by Dooley et al. One reason is that the costs of preventing appreciation have risen. Inflation is higher in emerging markets that have intervened to stem currency appreciation, as are domestic interest rates, raising the carrying costs of holding foreign exchange reserves (see the discussion below and the contribution by Mohanty and Turner in this volume). Another reason is that while real exchange rates have depreciated in these economies the region has not preserved its lead in global exports or prevented the relocation of production to China. Thus, exports have fallen well below China's, and are even below Latin America's (where exchange rates appear to be much more flexible). Net FDI has also fallen off sharply, and recent research suggests that FDI to China displaces (in relative terms) FDI to other Asian economies (Chantasawat et al (2004)).⁷ It is worth highlighting that these developments are not all negative: they have been associated with the development of

⁷ The authors find that the level of Asia's (excluding China) FDI is positively related to the level of FDI to China. However, the share of Asia FDI in global FDI is highly negatively correlated to FDI to China. More generally, growth and inflation benefits from pegs might accrue only to less developed countries that are not well integrated with global financial markets, not more advanced countries. For EMEs growth or disinflation gains from pegging appear to be nullified by vulnerability to crises, which is why many emerging markets that used a peg as a nominal anchor now float.

production networks linking China and the rest of East Asia that appear to have enhanced the economic resilience of the region.

Third, how far is the bilateral exchange rate (eg vis-à-vis the dollar) targeted rather than the effective exchange rate? The creation of the euro brought forth a large single currency trading area, but it is not clear to what extent this has been reflected in exchange rate targets or foreign reserve portfolios outside Europe. China's and Japan's role in Asian trade is also important. For example, the growing production networks between China and the rest of Asia suggest that these countries need to pay increasing attention to their exchange rates relative to each other's currencies, rather than focusing exclusively on the US dollar. Also, the fact that Korea (for example) competes directly with Japan in third markets (including the Chinese market) can reasonably motivate assignment of a greater weight to won/yen fluctuations as opposed to won/dollar fluctuations. This will be particularly relevant during periods when the yen weakens against the dollar.

Fourth, how should an exchange rate band be designed (slope and central tendency, width)? On the one hand, a tight band can dampen short-run volatility, which can be important in a very open economy, while allowing considerable adjustment in the long run. On the other hand, structural changes (eg lower exchange rate pass-through, greater vulnerability to interest rate shocks due to higher household indebtedness) might imply that more exchange rate volatility would be acceptable in order to smooth interest rate fluctuations. Singapore provides an example of these trade-offs: a tighter band is seen as giving less leeway to speculative accounts drawn to the relatively good liquidity of the Singapore dollar foreign exchange market, but recent structural changes prompted a private sector proposal calling for a permanent widening of the Singapore dollar exchange rate band. In Israel, intervention attracted persistent capital inflows that needed to be sterilised. A significant adjustment to the intervention band (which still exists) permitted the Bank of Israel to stop intervening in June 1997, alleviating losses it had experienced from intervention (see Sokoler's contribution to this volume).

Fifth, what is the appropriate degree of transparency in an exchange rate target? On the one hand, transparency can help coordinate expectations and improve market efficiency. On the other hand, information about specific targets can trigger speculation. For example, Israel for a time targeted a publicly disclosed midpoint of a crawling band, but this led to speculative pressure, prompting the central bank to cease intervening as long as the exchange rate remained within the band. Hungary stopped disclosing its band (narrower than the $\pm 15\%$ allowed under the criteria for entry into the euro zone) because policymakers feared that markets would attack it. Singapore provides qualitative information on its band, but it does not disclose the precise width so as to deter speculative attacks. Similar considerations have prompted Hong Kong to maintain an asymmetric exchange rate target. There is a floor at 7.80 at which point the convertibility undertaking is triggered. However, there is no explicit target to limit currency appreciation. As noted by Pang in this volume, this makes it difficult for speculators to calculate the cost of shorting the Hong Kong dollar. For further discussion of tactical issues of intervention, see Archer's contribution to this volume.

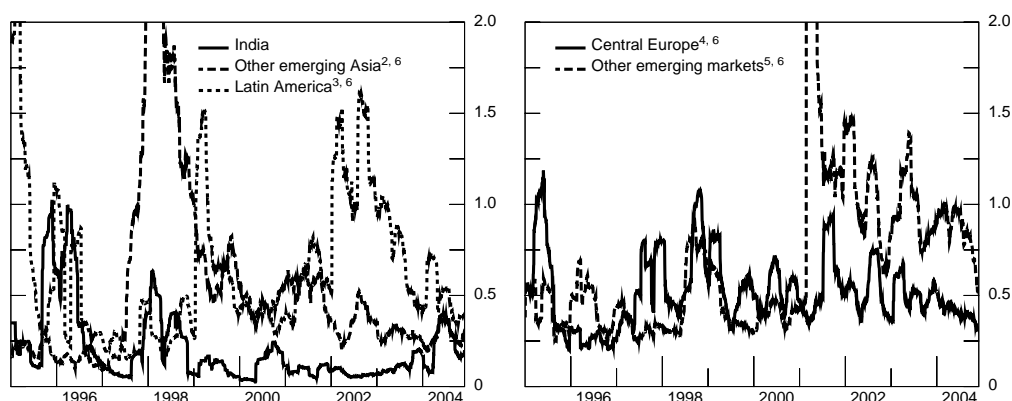
The answers to the preceding questions may depend in part on the roles of the ministry of finance (or other government authorities) in exchange rate policy and intervention, and the extent to which their objectives differ from those of the central bank. In some countries, the ministry of finance would favour intervention to preserve competitiveness while the central bank would be more concerned with intervening in a way consistent with achieving its inflation goals. Disagreements of this kind appear to have had a significant impact on intervention in some cases; the extent may depend on arrangements discussed in more detail in Moser-Boehm's paper in this volume.

B. Intervention under floating

1. Higher exchange rate volatility

Since the collapse of pegged exchange rate regimes in the second half of the 1990s, many countries have switched to floating exchange rates with inflation targeting. Graph 2 reveals that high volatility during crisis episodes in the 1990s makes it hard to tell whether volatility has risen in recent years. However, a close examination of Graph 2 suggests that exchange rate volatility (against the US dollar) in emerging Asia (excluding China and India) and Latin America increased significantly in this decade, compared to periods of exchange rate stability in the 1990s (1995-96 in Asia, and 1996-98 in Latin America). Volatility has recently risen somewhat in India. Turning to the second panel, exchange rate volatility (against the euro) has remained roughly stable in central Europe, but has increased significantly since 2000 in other emerging markets.

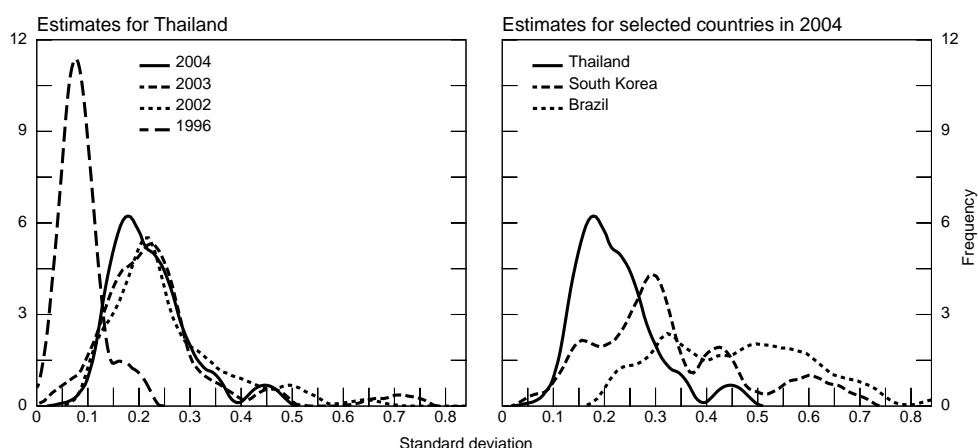
Graph 2
Trends in daily exchange rate volatility¹



¹ Calculated as the 60-day rolling standard deviation of daily percentage changes in the exchange rate, where exchange rate is defined as the local currency against the euro for central Europe and against the US dollar for others. ² Hong Kong SAR, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan (China) and Thailand. ³ Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. ⁴ The Czech Republic, Hungary and Poland. ⁵ Israel, South Africa and Turkey. ⁶ Weighted average of the economies listed based on 2000 GDP and PPP exchange rates.

Sources: Datastream; ECB; BIS calculations.

Graph 3
Density estimates of 10-day rolling exchange rate volatilities¹



¹ Estimated with Epanechnikov kernel using a bandwidth of 0.0483. 2004 estimates based on data up to end of October.

Source: BIS calculations.

Changes in volatility are revealed more clearly by shifts in the estimated densities of rolling daily standard deviations during years of relative tranquillity. To illustrate, in Graph 3, the left-hand panel shows that, for the baht/dollar exchange rate, the short-run average volatility that is apparently tolerated by the Thai authorities has increased considerably since 1996; the mass of the distribution has shifted to the right and there is also more mass at higher volatilities (the right tail of the density). On the other hand, there is a striking similarity in the estimated densities in recent years. The right-hand panel of Graph 3 reveals that in 2004 the estimated density for the Thai baht was still to the left of the Korean won's. The Brazilian real has been subject to much more volatility than either of these

two currencies: the density over the interval shown appears to be much flatter and the incidence of higher volatility is also greater. It may be noted that, in contrast, exchange rate volatility has actually *fallen* in recent years in some countries that have not actively intervened (Mexico and Israel), suggesting the presence of stabilising speculation.

Greater tolerance for exchange rate volatility is reflected in an apparent decline in intervention in foreign exchange markets in recent years (see Mihaljek's paper in this volume). One reason is that some economies are now more resilient to exchange rate fluctuations. Improved macroeconomic policies and policy credibility have reduced the short-term pass-through of exchange rate changes to inflation. At the same time, currency mismatches have declined (see Andersen and Moreno (2005), Graph 2), reducing the extent to which currency depreciation could weaken the financial sector and result in sharp contractions in output.

A second reason is that floating has advantages: it can prevent exchange rate overvaluation, and may help stabilise capital flows (see eg the papers in this volume by Özatay on Turkey and De Gregorio and Tokman on Chile, and Cifuentes and Desormeaux (2005)).

A third reason is that intervention can impose significant costs and may also have become less effective.⁸ For example, foreign exchange market participants in one emerging market argued that tight limits on bank position-taking, the absence of speculators and regular intervention (once or twice a week, occasionally on both sides of the market within a week) reduced the scope for stabilising speculation and stunted market growth. It is also thought that very large foreign exchange market intervention designed to maximise the impact on the foreign exchange market has in some cases deterred private sector participation and impaired price discovery. The costs of these distortions tend to be higher in countries where financial markets are more developed. Intervention also tends to be less effective in more developed financial markets, where the substitutability of domestic and foreign assets is higher. This might explain why foreign exchange market intervention is now comparatively rare in developed countries other than Japan.

2. Intervention goals under floating

Although reliance on intervention appears to have declined under floating, policymakers are not entirely indifferent to exchange rate volatility. Questionnaire responses for the 2003 and 2004 Emerging Market Deputy Governors meetings indicate that intervention can at times recur over extended periods (weeks) and involve significant amounts. Under floating, intervention in part reflects the desire to preserve macroeconomic or financial stability (Table 1). For example, in 2002 sharp currency depreciation in Brazil was followed by a rise in inflation which required raising the inflation target. The central bank intervened and also raised interest rates. Emerging foreign exchange markets are also more prone to one-sided bets and instability, because they are thin and subject to a high degree of uncertainty and information asymmetries. Countries with high debts, currency mismatches or fragile financial sectors are particularly vulnerable.⁹ In line with this, many countries cite lack of depth in the foreign exchange market as an important factor behind intervention. In principle, misalignment and external balance should be less of a concern under floating, but, as discussed below, in practice it appears to be an important reason for intervention.

Given these concerns, what do central banks target when deciding to intervene? Questionnaire responses and discussion at the meeting suggest that there is no single target under floating exchange rates. The immediate goals of intervention can include: (a) dampening volatility symmetrically; (b) countering excessive exchange rate movements or overshooting; (c) reducing the rate of change in the exchange rate ("leaning against the wind"); and (d) supplying liquidity to the market. In cases where the threat of disorderly markets is more immediate, concern about exchange rate movements becomes secondary and the primary goal is to supply liquidity to ensure the market keeps functioning. Some examples follow.

⁸ Other costs of intervention are cited by Mohanty and Turner's contribution to this volume.

⁹ In contrast, in developed countries a main concern has been the potentially adverse effects of exchange rate volatility on international trade. The effects may be apparent only in the medium term and research has generally found these to be small. There are a number of reasons for this intervention, including to prevent sharp movements in tradable goods prices and resource misallocation that might arise.

(a) *Dampening volatility symmetrically*

On average, about 48% of respondents cited dampening exchange rate volatility as having been one of the immediate objectives of foreign exchange market intervention since the beginning of the decade. Views differ on conditions under which volatility should be a concern. One view is that policymakers should not dampen short-run volatility in foreign exchange markets, in order to encourage risk management and financial market development. In contrast, it is desirable to dampen volatility at longer horizons. For example, the Czech National Bank does not intervene in response to short-run daily exchange rate volatility, as measured by rolling standard deviations over a 60-day period. On the other hand, Bank Indonesia has intervened during periods when rupiah volatility has exceeded average annual volatility. Bank Indonesia considers the intervention effective if volatility falls (see Holub's and Bank Indonesia's respective contributions to this volume). In some situations, short-run volatility might be seen as potentially destabilising and might nevertheless trigger a response (see discussion of liquidity below).

(b) *Preventing excessive exchange rate movements or overshooting*

While expressing concerns about volatility, questionnaire respondents also indicated that they intervene to influence the level of the exchange rate. Over the period 2000-04, 28% of (22) respondents said they intervened for this reason. One explanation is that central banks seeking to dampen volatility will in many cases not respond to direct measures of volatility such as rolling standard deviations, but might intervene in response to "excessive" exchange rate movements instead. Such movements might be considered excessive because they reflect persistent deviations from equilibrium, or misalignment. In line with this, the Czech National Bank defines long-run volatility in terms of extreme fluctuations around a long-run trend. In 2004, the Reserve Bank of New Zealand introduced a similar criterion as the basis for possible intervention. Alternatively exchange rate movements might be considered excessive because of their impact on inflation or on financial stability.¹⁰ For example, Mexico intervened in response to very large peso depreciation in September 1998 caused by the Russian crisis and the near collapse of Long-Term Capital Management, a US fund. Chile responded to large depreciations on two recent occasions (August to December 2001 and October 2002 to February 2003) by preannouncing total (but not daily) sterilised intervention amounts over each period and the form of intervention.¹¹ Colombia's volatility options are another example, as one of the goals of this mechanism is to avoid excessive *movements* in the exchange rate, in order to support achieving the inflation target. The concern with excessive exchange rate movements applies to large developed regions as well; in 2000 the European Central Bank intervened when exchange rate movements were thought to pose risks for price stability.

Other forms of foreign exchange market operations can also limit excessive exchange rate movements. South Africa has taken advantage of periods when there is a large influx of foreign currency liquidity in the market (eg due to large export receipts or investment transactions) to purchase foreign currency in order to build reserves; the effect would be to dampen possible spikes in the exchange rate. In some cases, central banks have engaged in *passive intervention* to prevent the foreign currency from reaching the market, eg when there are large revenues from foreign direct investment or from commodity exports. For example, the Mexican oil company Pemex can only acquire pesos by depositing its dollars in the central bank; it typically does this when it needs to meet its tax obligations. A similar mechanism to channel foreign currency privatisation revenues away from the foreign exchange market by depositing them in the central bank was set up in the Czech Republic (Sidaoui (2005) describes the case of Mexico, Holub in this volume the case of the Czech Republic, and Mihaljek (2005) provides a more general discussion).¹²

¹⁰ The distinction is made for purposes of clarity. However, it is not entirely straightforward, because central banks have multiple objectives and might also be concerned with external balance when trying to dampen excessive movements in the exchange rate. It is not always possible to tell what their real motivation is.

¹¹ The effect of sterilised intervention appeared to be small, but the effect of the announcement was large.

¹² One implication is that the transactions of the petroleum revenue stabilisation fund are entirely in local currency, so it poses no issues for foreign exchange market intervention. On the other hand, the oil stabilisation fund in Venezuela is maintained in US dollars by the central bank.

One participant suggested that central banks might cite volatility as their intervention goal when they are in fact concerned with deviations from equilibrium or the magnitude and direction of exchange rate movements. However, another participant stressed the importance of reassuring markets that the exchange rate level was not being targeted. Other participants said that volatility is worth monitoring separately for signs of disorderly markets, even when attention is paid to the exchange rate level.

(c) *Leaning against the wind*

Policymakers are typically concerned not just with how much the exchange rate might deviate from equilibrium but with how quickly it does so. Intervention will often attempt to *slow the rate of change in the exchange rate* without preventing trend changes, a policy that is known as “leaning against the wind”. While intervention of this kind typically occurs when the exchange rate is moving away from equilibrium, it can sometimes occur if the exchange rate is moving back to equilibrium, but “too quickly”. Slowing the rate of change in the exchange rate can stop herding behaviour by acting as a circuit breaker. By reducing uncertainty, this type of intervention may facilitate foreign exchange market development and enhances the availability of hedging instruments (eg for agents in the tradable goods sector). On the other hand, by acting as a provider of “insurance” against rapid exchange rate movements, official intervention could also undermine incentives for the development of hedging capability in the private sector. As reported by participants at this meeting, this has been the experience of Chile, Israel and Mexico.

On average over the last five years, 19% of respondents to the questionnaire indicated that they practice “leaning against the wind”. For example, “volatility” options used by the central bank of Colombia are also designed to moderate excessive and abrupt movements in the exchange rate from its recent trend that could lead to changes in expectations that drive the exchange rate away from its fundamentals (see Uribe’s paper in this volume and Uribe (2005)). Leaning against the wind is described as the main focus of intervention in Peru, and was used to calm markets and dampen volatility during a period of exchange rate pressure in 2002 (reflecting investor risk aversion and political uncertainty in Brazil). More recently, intervention has been used to smooth appreciation pressures (see Armas’s paper in this volume).

(d) *Supplying liquidity (or serving as market-maker of last resort)*

Episodes of financial stress can trigger intervention. On average, 21% of the respondents to the questionnaire indicated that they intervened in response to extreme events, while 55% said they intervened to curb excessive exchange market speculation. During such periods, liquidity can collapse among market-makers, with severely impaired price discovery and problems in getting private transactions executed. Maintaining convertibility is the prime objective of this type of intervention, which is consistent with preserving financial stability and preventing crises. Intervention might also have the desirable effect of limiting the extent of overshooting that might result from the disappearance of liquidity by restoring effective price discovery, although this is not the main objective.¹³ Among the respondents to the questionnaire, 41% indicated that they had intervened to provide liquidity in thin foreign exchange markets. For example, Brazil and Korea have intervened during periods of foreign exchange market volatility triggered by political uncertainty to supply liquidity to foreign exchange markets and fill gaps between bids and offers in this market (see eg Rhee’s paper on Korea in this volume). In Brazil, intervention was accompanied by the issuance of foreign currency-linked debt as a hedging instrument. The effect was the continued operation of the foreign exchange market under conditions in which it otherwise might have collapsed.

C. Influencing the amount of foreign reserves

Another motive for central bank operations in the foreign exchange market is to influence the level of foreign exchange reserves. Many central banks have sought to accumulate reserves, a policy more or less continuously followed by a number of Asian economies since the crises of the late 1990s and

¹³ In extreme cases where the foreign exchange market has become extremely illiquid as a result of withdrawal of market-making by shell-shocked financial institutions, central banks/governments might choose to supply foreign exchange at off-market prices to shelter domestic firms from being forced either to default or to settle obligations at ruinous prices.

more recently by a number of Latin American central banks. Others have sought to reduce the growth in or the level of reserves (Mexico and Chile). Three broad considerations may guide the criteria and choice of instruments for, and tactics used in, regulating the amount of reserves: (a) exchange rate impact; (b) market friendliness; and (c) costs versus benefits.

(a) Exchange rate impact

While the goal of other types of central bank participation in the foreign exchange market cited above is to maximise the impact on the exchange rate, the goal when seeking to influence the amount of reserves is to *minimise* this impact. There is keen awareness of this issue in a number of emerging market central banks. For example, both Mexico and Colombia have used options mechanisms for regulating the amount of foreign reserves to ensure that the central bank does not accumulate reserves when the domestic currency is under depreciation pressure (see Sidaoui (2005) and Uribe (2005) for descriptions). Mexico's use of a preannounced formula to limit the growth in foreign reserves and the policy of spreading out foreign currency sales on a daily basis over a period of time would also tend to minimise the exchange rate impact. Turkey has used preannounced, rule-based foreign exchange purchase auctions to accumulate foreign reserves. South Africa's policy of "creaming off" uses another approach to limit the exchange rate impact, as reserves are accumulated during periods when the market is flush with foreign liquidity (see Özatay's paper on Turkey and the paper contributed by South Africa for this volume).

(b) Market friendliness

This is important because government policies can impair foreign exchange market development and price discovery. One issue is the size of the central bank presence in the foreign exchange market, which as suggested earlier can discourage private sector participation. By this criterion, policies that minimise the exchange rate impact of central bank operations to influence reserves would tend to be market friendly. Another issue is the use of supplementary measures, such as foreign exchange controls, to ensure foreign reserves are channelled to the central bank. This is an issue in emerging market economies that impose foreign exchange surrender requirements.

(c) Costs and benefits

A primary consideration in any decision affecting the level of reserves is the marginal costs of an additional dollar of reserves against the marginal benefits, an issue that has been explored by a number of central banks (eg Chile and Mexico).¹⁴ For example, if the impact on competitiveness is not a consideration, the marginal benefit of an additional dollar in foreign reserves could be estimated as the expected reduction in the cost of a currency crisis based on early warning system estimates (ie the change in the probability of a crisis associated with an increase in reserves times the cost of a crisis) while the marginal cost is the opportunity cost of holding reserves (eg the sovereign spread - which assumes reserves are financed by foreign borrowing - times the change in reserves).

Assessing marginal benefits in this way is a step beyond traditional measures of reserve adequacy which are based on rules of thumb, of which there are now many. For example, De Beaufort Wijnholds and Kapteyn (1999) suggest that the traditional benchmark, reserves to imports, is obsolete and the emphasis should be on coverage for possible flight from the banking system (reserves to M2), or to the possibility that short-term external financing will dry up (reserves to short-term debt, also known as the Guidotti rule). Reserve holdings are presented in terms of these three benchmarks in Table 2.

¹⁴ See Sidaoui (2005). Some of the discussion also draws on points made by Esteban Jadresic of the Central bank of Chile at a central bank workshop in Brasilia in 2004.

Table 2

Foreign exchange reserves and measures of adequacy

	Foreign exchange reserves:							
	Outstanding year-end position ¹		As a percentage of					
			Imports		Broad money		Short-term external debt ²	
	1994	2003	1994	2003	1994	2003	1994	2003
Asia, large economies ³	188	862	57	109	12	19	215	687
China	52	403	45	98	9	15	267	1,300
India	19	98	72	139	13	25	257	598
Korea	25	155	24	86	7	21	60	289
Taiwan, China	92	207	108	161	20	33	485	835
Other Asia ³	71	132	43	59	25	32	113	294
Indonesia	12	35	37	105	15	31	54	258
Malaysia	25	43	42	54	40	39	355	416
Philippines	6	13	28	36	18	30	179	121
Thailand	29	41	53	55	26	29	92	404
Latin America ³	92	171	54	60	20	29	85	137
Argentina	14	13	64	95	26	34	63	55
Brazil	37	49	112	102	24	35	128	124
Chile	13	15	120	86	78	46	197	138
Colombia	8	10	65	73	51	44	151	277
Mexico	6	58	8	34	3	18	16	157
Peru	7	10	125	119	77	54	304	164
Venezuela	7	16	83	156	50	82	172	493
Central Europe ³	19	73	38	48	24	37	271	240
Czech Republic	6	27	36	53	22	40	304	473
Hungary	7	12	46	25	35	29	202	98
Poland	6	34	34	64	19	38	367	274
Israel	7	26	29	75	12	22	358	438
Russia	4	73	8	97	14	67	22	284
South Africa	2	6	8	18	3	6	19	63
Turkey	7	34	31	49	22	32	80	148
All countries above ³	391	1,377	47	83	15	23	129	354
<i>Memo:</i>								
<i>Australia</i>	11	30	20	34	6	7	21	24
<i>Japan</i>	115	653	42	170	2	10		235
<i>Sweden</i>	23	18	43	22	24	12		15

¹ In billions of US dollars. ² Short-term external debt defined as short-term liabilities to BIS reporting banks: consolidated cross-border claims of all BIS reporting banks on countries outside the reporting area with a maturity up to and including one year plus international debt securities outstanding with a maturity up to one year. ³ Sum or average of the countries shown.

Sources: IMF; national data; BIS.

As for costs, they depend in part on the level of reserves and how intervention is financed. Research suggests that higher foreign reserves can reduce sovereign spreads as well as improve credit ratings (Moreno and Turner (2004)). Thus the costs of holding reserves can narrow through this channel as reserves rise. At the same time, whether foreign reserves are financed by money creation, by the issuance of central bank instruments, by the sale of government securities or by foreign borrowing has different implications for currency and duration exposures, the profitability of the central bank and overall costs. The choice of financing also influences who bears the cost: the public at large through inflation or taxation or the central bank. Except in countries with pegged exchange rates, policymakers cannot generally finance foreign reserve accumulation through money creation without undermining domestic policy objectives (ie the importance of sterilising intervention is widely recognised). Some countries resort to foreign currency financing of foreign reserve purchases, in part to limit the direct impact of reserve accumulation on the central bank income statement. Others rely on financing of foreign reserve purchases through the sale of treasury securities or the issuance of central bank securities. This can raise the cost of financing recorded in central bank statements, but reduce the net external indebtedness position of the government and overall currency mismatches in the economy. Some of the implications of intervention are discussed by Mohanty and Turner's paper in this volume.

There are no available cross-country studies comparing marginal costs to marginal benefits of foreign reserve accumulation. However, recent measures to reduce foreign reserve holdings and to limit foreign reserve growth suggest that in some Latin American countries (Chile, Mexico) the costs of holding additional foreign reserves exceed the benefits. In contrast, a number of Asian countries with much higher foreign reserve levels do not appear to consider a reduction in reserve holdings a priority.¹⁵ The reasons for the contrasting reserve levels also warrant further research. Possible explanations include relatively low interest rates in Asia (which reduce marginal costs of reserve acquisition); foreign reserve accumulation as a by-product of other policies, such as a desire to influence the exchange rate in order to preserve competitiveness; and political economy considerations. These last issues may arise when large-scale foreign exchange reserves appear as a highly visible and apparently freely available resource for politicians to spend on public works. Some recent research suggests that it is optimal to hold lower foreign reserves if the government is more inclined to spend them (Aizenman and Marion (2004)).

III. Conclusion

Central banks intervene in foreign exchange markets to achieve a variety of macroeconomic objectives, such as controlling inflation, maintaining competitiveness or maintaining financial stability. However, the specific motives for intervention are likely to change with their level of economic and financial development. Central banks in countries at earlier stages of development often intervene to support a pegged exchange rate, and are also more likely to function as "market makers", supplying liquidity in less developed foreign exchange markets. More advanced emerging markets have generally adopted flexible exchange rates and intervention is more likely to focus on dampening exchange rate volatility. Central banks thus enter the foreign exchange market to prevent overshooting or slow the speed of adjustment in the exchange rate, and to supply liquidity during periods of financial stress. Central banks also enter the foreign exchange market to regulate the amount of foreign exchange reserves, either to accumulate the hard currency needed for intervention, or to reduce reserves in order to lower carrying costs.

¹⁵ This is the case even if foreign reserves in Asian economies already exceeded a popular liquidity benchmark (the Guidotti rule) by 1999. The IMF (2003) finds that reserve holdings in Asia exceeded those predicted by a set of determinants of demand for reserve holdings.

Annex

Two definitions of intervention: narrow versus broad

There are two views on how foreign exchange market intervention should be defined. One is that the definition should be *narrow*: central bank transactions in the foreign exchange market should be called “intervention” only if (1) they are sterilised, ie are offset by central bank transactions that nullify any impact on domestic money creation (unsterilised intervention would then be considered monetary policy); (2) the purpose is to influence the exchange rate.¹⁶ Sterilised intervention would be viewed as distinct from monetary policy, and multiple goals that could otherwise be in conflict can be achieved.

Excluding central bank operations that are not intended to influence the exchange rate can rule out a number of transactions that might have no underlying stabilisation policy goal, such as small technical transactions, foreign reserve purchases financed by foreign currency borrowing, or transactions that are similar to those of other economic agents and are related to underlying economic activities (eg using foreign reserves to purchase a piece of equipment on behalf of the government). In some cases central banks do not consider as intervention transactions that are mainly intended to regulate the amount of foreign reserves, particularly if they are automatic or based on rules, rather than discretionary. For example, Mexico’s operations to limit the growth in reserves by selling foreign currency according to a predetermined formula are arguably not intervention as narrowly defined.

However, focusing exclusively on a narrow definition of intervention can lead one to overlook important policy issues, particularly in emerging market economies. First, central bank operations in emerging foreign exchange markets are often not (immediately) sterilised or the instrument used in sterilisation might be of short duration.¹⁷ Indeed, many central banks *have relied on operations in the foreign exchange market as a way to implement monetary policy*, which would imply not sterilising at all. Even when the exchange rate is floating, central banks sometimes prefer to intervene in the foreign exchange market rather than conduct an open market operation to achieve a monetary policy objective.¹⁸ Understanding the motives for and characteristics of central bank operations in the foreign exchange market under these conditions is of considerable policy interest, whether the operation is labelled intervention or not.

Second, central bank foreign exchange transactions can affect the exchange rate even if this is not the primary intention. For example, in pursuing its policy of reserve accumulation, the South African Reserve Bank (SARB) tries to limit the impact on the exchange rate by entering the market only when large supplies of foreign currency become available. It is also “quiet”: it does not announce its transactions in real time (they can be inferred *ex post*, from the central bank balance sheet), and will typically not initiate large transactions but will wait for holders of foreign currency to offer it to the SARB. However, the transactions are large, so it is likely that the impact on the exchange rate is significant, even if this is not the primary purpose (see discussion in this paper). Reserve accumulation can also affect the exchange rate because of its impact on sovereign ratings and spreads (Moreno and Turner (2004)). Mihaljek’s paper in this volume reports that a significant number of central banks find some positive impact of reserve accumulation on sovereign credit ratings.

Some therefore favour a *broad* definition of foreign exchange market intervention. A widely cited central bank working group report acknowledges that intervention is usually undertaken to influence the exchange rate, but defines it as “any sale or purchase of foreign exchange against domestic currency which monetary authorities undertake in the exchange market” (Jurgensen (1983)). This

¹⁶ On the other hand, one participant whose currency is pegged argued that day-to-day operations in which the central bank supplies foreign exchange or accumulates foreign reserves should not be considered intervention. The term intervention should in this view be reserved for exceptional cases.

¹⁷ For a general discussion of sterilised intervention and its limits, see Mohanty and Turner’s paper in this volume.

¹⁸ The reasons underlying the choice between the foreign exchange market and the domestic money market to implement policy warrant further investigation, but it is apparent that the foreign exchange market will be preferred when the benefits exceed the costs. For example, one participant noted that during an episode of sharp depreciation that threatened the inflation target by influencing inflation expectations, a very sharp rise in interest rates would have been required to stabilise the exchange rate. Intervention in the foreign exchange market was seen as preferable under these conditions.

applies to intervention in spot or forward markets, regardless of the form of financing (reserves, swaps, borrowing, etc).

An even broader definition includes “passive” interventions. Here the central bank takes foreign currency directly from public or private entities outside the market, in some cases as a result of surrender requirements. A traditional reason for such intervention is that the government wishes to control the allocation of foreign reserves. Another reason is to insulate the foreign exchange market from the impact of very large foreign exchange flows (ie to dampen exchange rate volatility).¹⁹ Some emerging market examples are discussed in this paper. Adams and Henderson (1983, page 3) argue that “such direct dealings of central banks, sometimes called ‘passive’ intervention, are actually as active as an effort to affect the ultimate relative supplies of securities denominated in different currencies as conventional operations are; they should therefore be included in a comprehensive intervention measure”. One implication of adopting a broad definition is that changes in foreign reserves (adjusting for exchange rate valuation effects) can be interpreted as closely reflecting intervention.

To sum up, there are pros and cons to adopting either the narrow or broad definition of foreign exchange market intervention. In practice, each central bank adopts the definition that it considers most appropriate for its purposes. The discussion in this volume therefore extends beyond the narrow definition of foreign exchange market intervention to include a range of central bank operations in the foreign exchange market.

¹⁹ There are still other measures governments adopt outside the foreign exchange market that can influence the exchange rate. For example, during periods of exchange market pressure, the Brazilian government has issued domestic currency debt linked to the exchange rate that has been used as a hedging instrument. However, this does not directly involve a sale or purchase of foreign exchange.

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Governance aspects of foreign exchange interventions

Paul Moser-Boehm

Introduction

This paper provides comparative information on governance arrangements guiding foreign exchange interventions, on central banks' related communications policies, and on the accountability of central banks for their intervention decisions. The paper makes use of data from the BIS survey carried out for the December 2004 Meeting of Deputy Governors.

Powers and decision-making

Allocation of powers in respect of monetary and financial policy is an issue of great significance, over which views differ from country to country, and change through time. Legislative reforms in recent years have generally given central banks greater operational independence, accompanied by increased accountability. Key institutional design issues at the heart of recent and earlier reforms include alignment of decision-makers' incentives with public policy objectives, the coordination of interacting elements of public policy, and time-consistency.

The close linkages between monetary policy and the exchange rate mean that public policy interests in each area cannot be treated separately. In principle this ought to lead to institutional designs with integrated governance arrangements for monetary policy and exchange rate policy. Yet in a number of countries, tensions between different governance arrangements have been carried over from earlier structures. In several cases, goal and operational independence have been granted to the central bank, but the government has authority over exchange rate policy. The potential for the central bank's domestic policy target to be undermined by a government decision on exchange rate policy is not always provided for within legislative or other conflict resolution procedures.

At the operational level, governance arrangements for foreign exchange interventions also seem somewhat less clearly defined and more opaque than those for making monetary policy decisions. In addition, foreign exchange interventions are an area where central bank actions remain behind the scenes more often than in other areas of conducting policy, for a range of clear and not-so-clear reasons. At the margin, this may call for clearer and more detailed related governance procedures inside the central bank than for activities that are carried out in the public eye, but detailed information on these internal governance mechanisms is not widely available.¹

Legal basis

There are two ways to consider the legal grounding of foreign exchange interventions by central banks. The first and broader question concerns the regime choice. What are the principal objectives of the central bank, and what are its powers in the area of monetary and exchange rate policy? For example, is an exchange rate objective set down in the central bank law?² And how are the powers to

¹ Often, formal statements on governance mechanisms focus on high-level aspects while questions of detail are covered in internal rules and procedures that are rarely published.

² Of course, the absence of an exchange rate objective is not inconsistent with a central bank conducting interventions, but their role and objectives may differ depending on the formulation of the policy objective.

decide on the exchange rate regime and to determine exchange rate policy distributed between the government and the central bank? For example, does the power to choose the exchange rate regime rest with the government, with the central bank having full control over exchange rate policy (deciding, for example, on the rate of crawl of a crawling peg, or the width of exchange rate bands in a hybrid model)? Or is exchange rate policy a shared responsibility, with, for example, both the government and the central bank determining operational objectives? The second, narrower question concerns the extent to which the central bank has the power to make foreign exchange interventions, to decide when to intervene and by how much, which resources it may use to intervene, who at the central bank may make the decision, and if there are specific reporting requirements.

We first address the broader question. As noted, many central banks have recently been mandated by law to pursue a price stability objective, and others choose to pursue such an objective as a concrete interpretation of a broader legal mandate. Table 1 shows that the central bank laws of industrialised countries often stipulate price stability as the principal objective, or set out a broader or more complex objective that combines the value of money, economic growth and overall public welfare (a much older tradition). By contrast, the central bank laws of many emerging market economies are of a vintage in between: they do not specify the broad objectives that are typical of relatively old central bank laws, but are also not so specific as to demand price stability, as has become almost the norm since the 1990s. Instead, many ask the central bank to maintain the value of the currency, without distinguishing between its *external and internal value*.³

Table 1
Primary objective of the central bank
Central bank laws of 90 countries and currency areas

	Preserve <i>internal</i> value of currency	Preserve <i>external</i> value of currency	Preserve value of currency	Broader or more complex objective
25 central banks in BIS survey	32% ¹	4%	32%	32%
53 emerging market economies	21%	4%	38%	38%
12 industrialised countries	42%	0%	0%	58%
Total	27%	3%	31%	39%

¹ Colombia, the Czech Republic, Hungary, Korea, New Zealand, the Philippines, Poland and Turkey.

This raises the question whether the choice of broader central bank mandates in emerging market economies is linked to their higher propensity than industrialised countries to engage in foreign exchange intervention. The link could be direct (a higher propensity for intervention could derive from the central bank's interpretation of the objectives specified in the law) or indirect (with the central bank law having been designed differently as a result of different needs).⁴ There does indeed seem to be widespread agreement that emerging market economies display greater aversion to exchange rate volatility than the typical floating exchange rate developed economy, as encapsulated by the "fear of floating" idea (Calvo and Reinhart (2000)). Against this background it would not be surprising if both central bank officials and lawmakers shared a broadly common perspective about the merits of

³ The inflation targeting frameworks adopted by many central banks typically give clear priority to a specific inflation target or target band but they are normally not mentioned explicitly in central bank laws.

⁴ Differences in the precise wording of the central bank's primary objective need not be a question of semantics. For example, in his statement to the Commission of Inquiry into the Rapid Depreciation of the Exchange Rate of the Rand and Related Matters (Myburgh Commission), the Governor of the South African Reserve Bank (SARB) discussed how the objective in the SARB Act and in the Interim Constitution of 1993 ("to protect the internal and external value of the currency ...") changed in the Constitution of 1996 ("to protect the value of the currency"), thus placing "greater emphasis or focus upon the Bank's role in striving for domestic price stability" (Mboweni (2002), p 3).

attempting to limit exchange rate fluctuations, and the trade-off with other policy objectives that might be involved. Hence lack of specificity in the law about the place of exchange rate objectives, and decision-making powers related thereto, might not be as large a source of potential confusion and conflict as would be the case in other circumstances.

There is great diversity regarding who has the power to choose the exchange rate *regime*. In about a quarter of the economies participating in the BIS survey, this decision is to be made jointly by the government and the central bank. Among the remainder, the following options occur (ordered by declining frequency): choice by the central bank; choice by the government; choice by the government after consulting the central bank; choice by parliament or the legislature; choice by the central bank subject to the agreement of the government; as well as several other variations. This diversity is notable and provides substance to the questions raised earlier concerning the extent of a central bank's monetary policy autonomy when the exchange rate regime choice is made elsewhere.

By contrast, the right to *implement* exchange rate policy (within the confines of the chosen exchange rate regime) is held by the vast majority of the central banks in the survey (78%).⁵ In Mexico, the central bank may implement exchange rate policy within guidelines set by the government and the central bank;⁶ in India, Korea and New Zealand exchange rate policy is a joint responsibility of the government and the central bank; and in Malaysia it is the prerogative of the government, after consulting the central bank. It should be noted that in many countries where governments retain a degree of involvement in decision-making on exchange rate policy, legally independent central bank decisions can have important consequences for the exchange rate. Thus, for example, a decision by the central bank to raise interest rates in pursuit of an inflation target may lead to an exchange rate appreciation. While this may be desirable from the perspective of the central bank because it will help bring down inflation, it may not be in line with the government's preferences concerning exchange rate policy. It is in such circumstances that an overlap between governance arrangements for monetary policy and exchange rate policy becomes significant.

Turning at last to the power to decide on specific foreign exchange *interventions*, there is a high - but not complete - degree of overlap with the power to conduct exchange rate policy. Who bears the initial financial risk and who owns the foreign exchange reserves are additional factors (Annex 1 to this paper provides details on the latter). More than 90% of the central banks in the survey have the power to decide on interventions, including the Reserve Bank of New Zealand (RBNZ), where exchange rate policy is a joint responsibility of the government and the central bank.⁷ In Mexico, intervention decisions are made jointly by the government and the central bank, and in Malaysia they are made by the government after consulting the central bank. Brazil, Hong Kong SAR, Korea, New Zealand, Peru and one survey participant that preferred not to be identified are the only economies in the survey where the central bank does not own the foreign exchange reserves in full or almost in full. In Brazil, they are owned by the government. In Hong Kong, they are held by the HKMA on behalf of the government, and the HKMA has the authority to decide on interventions subject to limits set by the Financial Secretary. The Bank of Korea has the power to decide on interventions using that portion of the reserves which it owns, after consulting the government; while the government has the final say on interventions using reserves it holds, after consulting the Bank. In New Zealand, some reserves are held by the Treasury and other government agencies, with informal protocols rather than clear legal authorities governing their accessibility by the central bank. Overall, however, the vast majority of central banks participating in the survey regard the powers they are given in their respective central bank laws as sufficient to allow them to conduct the intervention policy they deem appropriate.

⁵ The precise meaning of the right to conduct exchange rate policy depends on the exchange rate regime chosen. For a floating exchange rate regime, this right would at least cover verbal interventions, and typically allows the central bank to conduct actual exchange rate interventions with its own reserves if it chooses to do so.

⁶ The guidelines are set by the Foreign Exchange Commission, which comprises three members from the ministry of finance and three members from the central bank. The ministry of finance has ultimate control since the Minister of Finance has the power to decide in case of a tie, and any official decision by the commission must have at least one vote by a member from the ministry of finance in its favour.

⁷ In the RBNZ's case, while the Bank has the power to intervene on its own initiative, it bears the financial risk associated with the intervention. Where the government directs the Bank to intervene, the financial risk is transferred to the government.

⁹ The Bank of England Act contains specific provisions concerning transparency with regard to foreign exchange interventions (see next section) but not on the decision-making process itself.

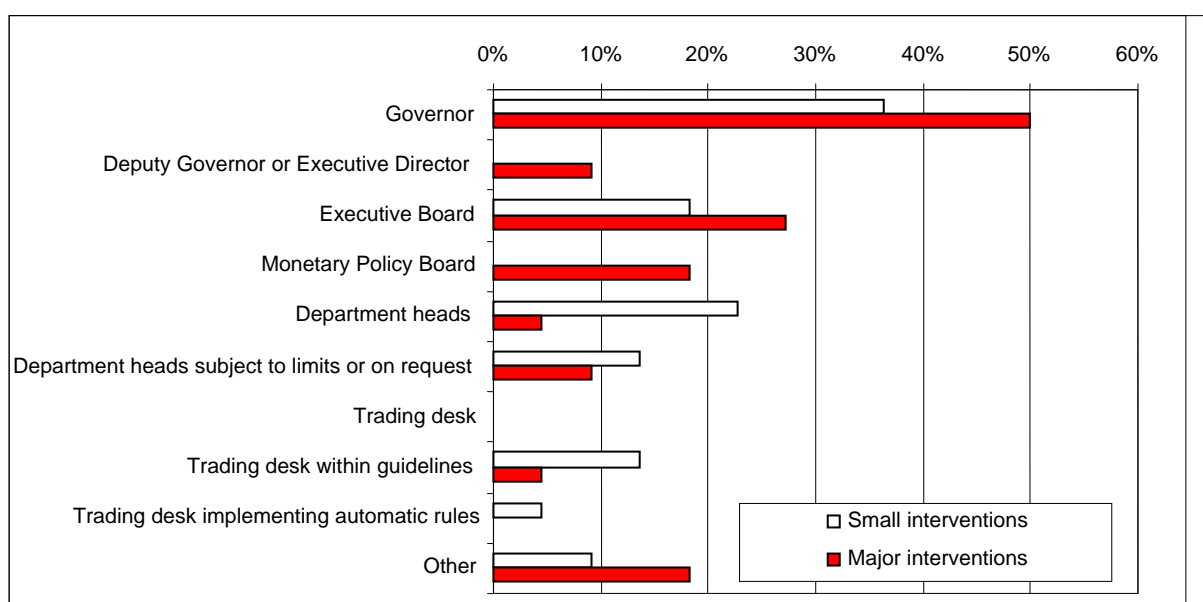
Decision-making inside the central bank

The vast majority of central bank laws do not contain specific provisions applicable exclusively to the central bank's arrangements for foreign exchange interventions or decision-making procedures for foreign exchange interventions. Instead, interventions are generally governed by the same rules as monetary policy decisions and actions, or as exchange rate policy matters if there are separate procedures for the latter (as is the case, for example, in Mexico).⁹

In practice, decisions on major interventions are usually reserved for the top decision-making authority within the central bank. Accordingly, such decisions are often the prerogative of the Board or the Governor (alone or under delegation from the Board, depending on the country and circumstances). The role of the central bank's staff is usually to provide advice, although decision-making power for small interventions is frequently delegated to the department or trading room level (Figure 1).

Figure 1

Executive authority for small and large foreign exchange interventions



A number of central bank practitioners stress the need for well developed internal decision-making procedures and guidelines on actual interventions. On the one hand, the trading desk has the most immediate access to market intelligence and typically a very good feel for the market, and delegating authority to the desk in deciding precisely where, when and how interventions are carried out can increase their effectiveness. This is especially relevant where the intervention strategy involves harnessing market dynamics to maximise impact on the exchange rate. Precise timing may be less of an issue where the objective of the intervention is, for example, to build reserves. Even then, however, most central banks have a concern to avoid adding volatility to the exchange rate, and detailed knowledge of current market dynamics can be valuable in that regard.¹⁰ Interventions for reserve building purposes will often involve a concern to transact at financially favourable prices, which may also require detailed market knowledge to achieve (unless auction-based alternatives are used for that purpose).

In addition, the market's response to an intervention may require immediate follow-up actions (such as a second intervention) in order to get the central bank's overall message across in full. If the mandate

¹⁰ The papers *Motives for intervention* and *Foreign exchange market intervention: methods and tactics* in this volume provide more discussion on these issues.

for the trading desk is overly narrow, the absence (or even delay) of such follow-up can obscure the message and ultimately damage the central bank's credibility.

On the other hand, if interventions are believed to make a genuine difference to the policy performance of the central bank, they need to be guided by those who are in charge of policy decisions and are held accountable for them, not least because they can be costly in terms of both money and reputation. In practice, this tends to mean that delegations to the trading desk are relatively narrow, and the head of department retains close operational oversight of any intervention. Nor is (formal or informal) delegation to the head of department usually extensive, given the policy and political sensitivity of intervention. In order to reduce the potential for delay as tactics need to be modified in line with the market's response, in most cases the central bank's senior management will make themselves available for immediate consultation.

The design of procedures and guidelines that strike the right balance between these two needs is probably not an easy task, and central banks may want to consider exchanging information in order to benefit from each other's experience. Instructions issued by the US Federal Open Market Committee (FOMC) provide an interesting example of a guideline that is in the public domain, particularly since its contents reflect the experience gained over a considerable period of time (see Annex 2 to this paper). Central banks may also wish to cooperate on exchanging information on codes of conduct and related procedures that are designed to ensure that advance knowledge of impending foreign exchange interventions is not used for illicit gains.¹¹

Transparency

Approaches

There has been an enormous increase in transparency on monetary policy in the past 10-15 years, reflecting the idea that a clearly specified monetary policy objective can be achieved more efficiently if markets and the public know how the central bank reads the economic situation and what determines its policy actions.¹² This increase in transparency coincided with (but typically was not primarily caused by) public demands for governments to become more transparent. Today, for many in the financial press and elsewhere a good central bank is a transparent central bank.

Yet foreign exchange interventions by central banks are often conducted secretly, and in general this is well accepted in markets and compliant with central bank laws as well as with codes of best practice. For example, the Bank of England Act of 1998 contains stringent requirements for the Monetary Policy Committee to release information about its policy deliberations and decisions, but exempts intervention activities from these requirements.¹³ And the IMF Code of Good Practices on

¹¹ Details on the precise nature of information passed on via electronic communications by an administrative staff member at the Central Bank of Chile are not known, but the incident led to the resignation of the Bank's Governor in 2003.

¹² Storgaard (2002) reviews this development with an emphasis on the role played by the choice of foreign exchange rate regime.

¹³ The relevant part of the Bank of England Act is: "15. -

- (1) After each meeting of the Monetary Policy Committee, the Bank shall publish minutes of the meeting before the end of the period of six weeks beginning with the day of the meeting.
- (2) Subsection (1) shall not apply to minutes of any proceedings relating to-
 - (a) a decision to intervene in financial markets, or
 - (b) a decision about the publication of a decision to intervene in financial markets, unless the Committee has decided that publication of the decision to intervene would not be likely, or would no longer be likely, to impede or frustrate the achievement of the intervention's purpose.
- (3) Minutes of proceedings relating to-
 - (a) a decision to intervene in financial markets, or
 - (b) a decision about the publication of a decision to intervene in financial markets, shall, if not required to be published before the end of the period of six weeks beginning with the day of the meeting, be published by the Bank before the end of the period of six weeks beginning with the day on which a statement about the decision to intervene is published under section 14(5).

Transparency in Monetary and Financial Policies recognises that “there are circumstances in which it would not be appropriate for central banks to disclose their near-term monetary and exchange rate implementation tactics and provide detailed information on foreign exchange operations”. The quotation contains part of the answer to the question of why there are valid limits for transparency on foreign exchange interventions: transparency about the objective need not be synonymous with transparency on related tools and tactics. Holub (in this volume), amongst others, points to a second reason: transparency about operations in the foreign exchange market may impede their effectiveness.

The paper by Archer in this volume (*Foreign exchange market intervention: methods and tactics*) provides a discussion of the possible connections between transparency and effectiveness, and Mihaljek’s paper (*Central banks’ views on foreign exchange intervention*) draws together the perspectives of central banks. Holub (in this volume), in reviewing the Czech National Bank’s experience with various intervention tactics (including open and secret interventions), draws a conclusion that could also be a summary of these papers - namely that it is impossible to extract a mechanical rule: “Something that did work in one situation may have had little effect in another one”.

The issue of transparency in the context of this paper has more to do with accountability than tactics. A prerequisite for effective accountability is information. That is clear in terms of information about implementation strategy, without which any assessment of consistency with stated policy would be very difficult. It may also be the case that information on tools and tactics is needed in order to assess actual performance against professed strategy. Quite frequently, central banks distinguish between information on strategy and on actual interventions that is released *ex ante* or *ex post*. Presumably, the former approach is intended to support the policy objectives of the central bank while the latter is deemed important for holding the central bank to account. At this point, if not before, the potential for tensions between possible harm to policy effectiveness and likely gains in accountability arising from full transparency becomes apparent, for one thing because *ex post* announcements on strategy or actual interventions are bound to influence market expectations for the future. It would not be surprising then if different judgments were reached in different circumstances on the appropriate balance to be struck. And that turns out to be the case for the group of central banks responding to the BIS survey. Tables 2a and 2b summarise practices with respect to releasing information on central banks’ intervention strategies as well as on actual interventions.

To help identify potential linkages, Tables 2a and 2b include information on the size of the foreign exchange reserves central banks have available to conduct interventions, as well as on the principal motives behind interventions carried out in the past five years. The key point apparent is the absence of clear patterns linking the provision of information on interventions to size of foreign exchange reserves or motives for intervention. On the one hand, this means that the question whether (and if so, when) to publish information on intervention strategy and on actual interventions demands a detailed analysis (and perhaps some trial and error) because central bank practices vary so widely. On the other hand, the absence of a clear pattern of practices means that on this issue, central banks may have considerable room for choosing the communications approach they find works best in their circumstances.¹⁴

(4) Minutes published under this section shall record, in relation to any decision of the Committee, the voting preference of the members who took part in the vote on the decision.

(5) Publication under this section shall be in such manner as the Bank thinks fit”.

¹⁴ This is in contrast to, for example, communications on monetary policy, where central banks can be under strong pressure from market watchers or the financial press to adopt one particular model that these observers feel is clearly superior over others.

Table 2a

**Publication of information on intervention
and level of foreign exchange reserves**

Information on ...	When	Level of foreign exchange reserves ¹					
		In absolute terms ²			In relative terms ³		
		Low	High	Total	Low	High	Total
Strategy	Regularly	AR, CZ, HU, IL	HK, IN, TR	7	CZ, HK, HU, TR	AR, IL, IN	7
	If changed	CL, CO, NZ, ZA	BR, MX	6	MX, NZ, ZA	BR, CL, CO	6
	<i>Either or both</i>	8	5	13	7	6	13
	No	PE, PH, VE	KR, ID, MY, PL, SG, TH		PH, PL, MY, TH	KR, ID, PE, SG, VE	
	<i>No</i>	3	6	9	4	5	9
Intervention	Same day	AR, CO, PE	BR, MX	5	MX	AR, BR, CO, PE	5
	Regularly	CL, CZ, IL, ZA	HK	5	CZ, HK, ZA	CL, IL	5
	<i>Either or both</i>	7	3	10	4	6	10
	No guidelines/mixed	NZ, PH		2	NZ, PH, PL, TR		4
	No	HU, VE	ID, IN, KR, MY, PL, SG, TH, TR	10	HU, MY, TH	ID, IN, KR, SG, VE	8
	<i>No, no guidelines/mixed</i>	4	8	12	7	5	12
On strategy <i>and</i> on actual intervention		AR, CL, CZ, IL, ZA	BR, HK, MX		CZ, HK, MX, ZA	AR, BR, CL, CO, IL	
		5	3	8	4	5	9
On strategy <i>or</i> on actual intervention		CO, HU, NZ, PE	IN, TR		HU, NZ, TR	IN, PE	
		4	2	6	3	2	5
Neither on strategy <i>nor</i> on actual intervention		PH, VE	ID, KR, MY, PL, SG, TH		PH, PL, MY, TH	KR, ID, SG, VE	
		2	6	8	4	4	8

¹ The classification into "Low" and "High" was done by splitting the sample into two groups of the same size. ² Classified according to the absolute size of the foreign exchange reserves at end-2003 in US dollar terms. ³ Classified according to the size of the foreign exchange reserves relative to imports at end-2003.

Source: Central bank responses to the BIS survey.

Table 2b

**Publication of information on
intervention and motives for intervention**

Information on ...	When	Motives for intervention ¹					No interventions
		Level	Volatility	Moderation	Extreme events	Other	
Strategy	Regularly	CZ, HU, tr	ar, cz, IN, TR	CZ, hu	ar, CZ, hu	AR, HK	IL
	If changed	CL	br, CL, CO	CL	br, CL, mx	BR, CO, MX, ZA	NZ
	<i>Either or both</i>	4	7	3	6	6	2
	No	ID, kr, MY, SG, VE	ID, MY, PE, PH, SG, TH, VE	KR, PE, SG, VE	ID, MY, PH, VE	kr, MY, SG	PL
	No	5	7	4	4	3	1
Intervention	Same day		ar, br, CO, PE	PE	ar, br, mx	AR, BR, CO, MX	
	Regularly	CL, CZ	CL, cz	CL, CZ	CL, CZ	HK, ZA	IL
	<i>Either or both</i>	2	6	3	5	6	1
	No guidelines/mixed		PH		PH		NZ
	No	HU, ID, kr, MY, tr, SG, VE	ID, IN, MY, SG, TH, TR, VE	hu, KR, SG, VE	hu, ID, MY, VE	kr, MY, SG	PL
	<i>No, no guidelines/mixed</i>	7	8	4	5	3	2
On strategy <i>and</i> on actual intervention		CL, CZ	ar, br, CL, CO, cz	CL, CZ	ar, br, CL, CZ, mx	AR, BR, CO, HK, MX, ZA	IL
		2	5	2	5	6	1
On strategy <i>or</i> on actual intervention		HU, tr	IN, PE, TR	hu, PE	hu		NZ
		2	3	2	1	0	1
Neither on strategy <i>nor</i> on actual intervention		ID, kr, MY, SG, VE	ID, MY, PH, SG, TH, VE	KR, SG, VE	ID, MY, PH, VE	kr, MY, SG	PL
		5	6	3	4	3	1

¹ The columns represent the five choices offered in the BIS survey. Country codes in upper case mean that the motive applied in at least half of the years (in the period 2000-04) in which interventions were carried out; country codes are shown in lower case if the motive played a role less often.

Source: Central bank responses to the BIS survey.

A closer look, however, reveals three traces of a possible pattern in Tables 2a and 2b may still be worth discussing:

- The majority of central banks provide information on intervention strategy; a smaller number provide information on actual interventions (and the number of institutions doing so tends to decline with the timeliness of the information).¹⁵
- More information on actual interventions tends to be released if the objective is to affect the volatility rather than the level of the exchange rate.
- There may be an inverse relationship between absolute size of foreign exchange reserves and the amount of information released on interventions. Why this would be the case is difficult to say.

Selected detailed aspects

At least seven types of information concerning interventions may be distinguished:

1. Information on intervention strategy (eg in a periodic policy statement or an ad hoc announcement).
2. Open mouth interventions - here, the information is the intervention.
3. Real-time or near real-time information on actual interventions (eg newswire release, authorisation of counterparties to reveal information about the intervention).
4. Reports on actual interventions when they still may have a bearing on the market's perception of central bank behaviour (eg a monthly report).
5. Information for the record (eg in the annual reports of the central bank).
6. Historical information (eg the release of intervention data or transcripts of policy meetings with a lag of a number of years).
7. Information released in response to incorrect information circulating in markets (are false rumours ignored or refuted?).

The length of this list (which is probably not exhaustive) illustrates the usefulness of giving thought to a detailed communications strategy. Compared to the central bank's overall strategy for policy communications, this strategy may need to define different sets of responsibilities depending on the degree of transparency chosen for a particular action, to consider in more detail the approaches that can be taken in emergency circumstances, and to be particularly mindful of maintaining a level playing field for all outside the central bank for whom the information may be of value.

Concerning the technical issue of providing (or not providing) information to markets at the time of intervention actions, central banks have devised the following approaches:

No information. The Bank of Korea intervenes through agents selected among major banks, and imposes a confidentiality requirement on them to maintain secrecy concerning the intervention (Rhee (2004)).

Qualitative information. For the special case of a foreign exchange intervention, once the Bank of Canada has actually dealt through a broker, that broker may confirm to others that the Bank has dealt, provided the exact amount and price level are not revealed. The disclosure of any other information, in any other circumstance, is a breach of confidentiality.¹⁶

A contingent approach. In the United States, the Foreign Exchange Desk at the Federal Reserve Bank of New York has two options between which it can select, depending on the circumstances. If it feels that it is useful for information on the Fed's intervention to spread in markets, it can operate directly in the *interbank market*, allowing the bank that is counterparty to its trade to deal with the information as desired. News of such trades normally spreads quickly in the market, even though there is also some false information where a rumour of an intervention spreads without any intervention having taken

¹⁵ It is easy to speculate why this may be so - for instance, central banks may fear a loss of credibility and effectiveness if the extent of interventions (successful and unsuccessful) becomes known in detail, or they may be concerned that market participants may be able to extract their intervention rules from detailed data. Ultimately this is a question of tactics, and thus a matter for the paper by Archer in this volume.

¹⁶ See "Letter on Confidentiality" (www.fmac.ca/Profess/confidentiality.html).

place. If the Desk does not want its intervention to become known it asks a commercial bank to place bids or offers in the *brokers market*, and the same principles of confidentiality apply as would if the action was taken on behalf of any other principal.

Immediate information to counterparties/the public. When it conducted interventions in the past, the Swiss National Bank (SNB) dealt directly with foreign and domestic commercial banks operating in several Swiss cities (Fischer (2004)). After the completion of the transaction the SNB informed the counterparty that this had been an SNB intervention, and this information would spread quickly in the market. While the SNB made no formal announcement to news agencies it would confirm (or refute) rumours if asked by a newswire service that had picked up the information in the market. In Canada, a space is now reserved on the central bank's website for announcement of interventions to the public, with the announcement being immediate.

Announcement of a window and ceiling. In Chile, the central bank announced on 16 August 2001 that spot market interventions up to a maximum of USD 2 billion could occur until 31 December, and a similar announcement was made on 10 October 2002 for the period up to 10 February 2003 (Tapia and Tokman (2004)).

Pre-announcement. In some countries (for example, Colombia, Mexico, Chile and Brazil) interventions are conducted by way of auctions. In such cases, auction parameters are announced in advance.

Another interesting aspect is information flows from markets to the central bank. For example, when choosing which major banks to use as agents in its intervention operations two of the criteria The Bank of Korea uses are the ability of a bank to provide the central bank with instant market information, and its active role as a market-maker (see the contribution by Rhee in this volume). And last but not least, well functioning information flows between the central bank and the government are important. For instance, in the Czech Republic a special account was established at the central bank in early 2000 for foreign exchange privatisation revenues received by the government which had previously been a factor in the appreciation of the Czech koruna. The management of this account proved a useful vehicle for ongoing communication between the government and the central bank on foreign exchange matters (see Holub in this volume).

Accountability

Holding the central bank to account for intervention decisions is almost certainly more complex than accountability for the conduct of monetary policy. This is because interventions are actions on the margin; their impact is often extremely difficult to quantify, especially where the policy objective explicitly or implicitly involves altering the medium-term path of the exchange rate. In addition, an in-depth assessment of intervention actions would require a close familiarity with this complex and practice-oriented subject by the review body. At the same time, the financial consequences of intervention for the central bank and government accounts tend to be more obvious. This asymmetry creates an imbalance which can be highly problematic, and has at times led to severe subsequent difficulties for some decision-makers.

Judging by the coverage of intervention strategies and actions in central banks' annual reports (which in most cases remain their flagship publications for the purpose of official reviews and accountability), a legislator reviewing a central bank's performance would typically find considerably more data and analysis for the overall conduct of monetary policy than for intervention actions. But there are also substantial differences in the approaches chosen by individual central banks. To illustrate, Table 3 gives a qualitative picture of the information on intervention strategy and intervention actions that is provided in central bank press releases, regular or ad hoc reports, and annual reports. It should be stressed that this table is based on a broad comparison of central banks' reports, and seeks to demonstrate similarities and differences in approach, without implying any rank ordering among them.

At times, central banks and ministries of finance are challenged in the political sphere for their intervention actions. To name just two examples, Saxton (1999) demands a substantially more transparent US dollar policy, arguing in part that this is necessary to comply with the Government Performance and Results Act. And in Korea, there have been strong demands in the legislature for the ministry of finance to provide more information on its interventions. In addition, there are cases where central banks have been asked to justify why they chose not to intervene in exchange markets. A well known example is the SARB's defence before the Myburgh Commission of not having intervened to stem the decline in the rand in the second half of 2001 (Cross (2002)).

Table 3

**Information on intervention strategy,
actual interventions and in annual reports**

(Fuller circles signify more detailed information)

Central bank of	Information on intervention strategy	Information on actual interventions	Coverage of foreign exchange intervention in annual reports	Average
Brazil	◐	◐	◐	◐
Chile	◐	◐	◐	◐
Czech Republic	●	◐	●	●
Hungary	●	○	●	◐
India	●	○	○	◐
Indonesia	○	○	○	○
Korea	○	○	◐	○
Mexico	◐	●	◐	◐
Peru	○	●	●	◐
Singapore	○	○	○	○
Turkey	●	○	●	◐

Resources and accounting

Closely linked to the question of accountability is the financial impact of intervention on the central bank, the government and, ultimately, the taxpayer. Friedman's (1953) argument that successful (stabilising) intervention should be profitable has been disputed by several authors (eg Neely (2000)), and it cannot be claimed that foreign exchange interventions need to be profitable in order to be welfare-enhancing (Murray et al (1990)). Achieving profits is not a primary objective for central banks, and net gains or losses from intervention operations should therefore not be a principal concern of policy, it is argued. Nonetheless, legislators and the general public tend to treat large official sector losses as prima facie evidence of failure. Moreover, given the difficulty in measuring the benefits of intervention, the defence that higher public policy goals have primacy is difficult to support with concrete evidence. Not surprisingly, therefore, Neely (2000) reports that although in a formal survey no central bank said that profitability was a consideration when intervention decisions were made, in conversation several central bankers said that the profitability of interventions was considered when assessing the central bank's stewardship of public resources.

All central banks participating in the BIS survey bear the initial costs of their foreign exchange interventions since they are carried out with foreign exchange reserves that are owned by the central bank or at least are on its balance sheet. Even so, ultimately the financial costs (or profits) from interventions are typically borne by the government and the public at large. They will eventually be reflected in the net surplus that the central bank transfers to the government, after deducting its operating costs and building reserves, as provided in the central bank law or in agreements between the central bank and the government. In Brazil, the foreign exchange reserves are owned by the government, and the government needs to compensate the central bank for related losses (but also receives all related profits).

As long as it does not create perverse incentives, the accounting approach that is used for the foreign exchange reserves (and thus for interventions) does not matter in the long term. However, the implications of choosing a particular type of valuation and recognition approach can be substantial on

a quarterly or annual basis, and it is important that the choice of approach be consistent with the rule governing the transfer of surpluses from the central bank to government (or the sharing of losses).¹⁷

Table 4 provides a stylised summary of the accounting policies followed by survey participants for their foreign exchange reserves.¹⁸ In all cases for which the information is available, fair value accounting is used, but there are significant differences in the way income is recognised. The most frequent approach is to build up a revaluation account from unrealised gains and losses which are thus reflected in the central bank's balance sheet but not in its statement of profits and losses.

Table 4
Accounting approaches for
foreign exchange reserves

Central bank of	Exchange rate revaluation			Income recognition of exchange revaluation gains and losses		Balance sheet exchange revaluation account (bypassing P&L)	
	Historical cost	Lower of cost or market value	Fair value	Asymmetric (P&L reflects unrealised losses)	Symmetric (P&L reflects both unrealised gains and losses)	Reflects only unrealised gains	Reflects both unrealised gains and losses
Chile			•		•		
Czech Republic			• ¹		•		
Hong Kong SAR			•		•		
Hungary			•				•
India			• ²				•
Israel			• ¹	•		•	
Korea			•				•
Malaysia			• ³				•
Mexico			• ³				•
Peru			•				•
Philippines			•				•
Poland			• ³				•
South Africa			•				•
Turkey			•				•

¹ As of every month-end. ² As of every week-end and month-end. ³ Daily.

¹⁷ The report of the Study Group on Central Bank Capital (2005) contains a detailed discussion of this issue.

¹⁸ The table and the associated classification were prepared by Christine Padua.

Coordination with government on debt management

Foreign exchange intervention can be defined as any operation that has the effect of altering the net foreign exchange position of the public sector - not just the central bank.¹⁹ Thus, there is an indirect link between intervention policy and foreign currency debt management when debt management decisions involve changing the currency composition of the government's debt portfolio and/or the currency exposure of the government's debt service obligations. In some countries that link can even be quite direct. In Brazil, for example, changes in the currency denomination of new debt issues have been implemented in a manner akin to an intervention tool to reduce the extent of exchange rate depreciation in crisis circumstances (in part by providing an onshore hedging instrument for the private sector). The index-linking of debt to foreign currencies has also been used in a similar manner, for example in Chile and Peru.

In the majority of cases in the survey, the governance arrangements accommodating this link (as well as information sharing on debt management more generally) involve a coordination mechanism between the central bank and the public sector entity responsible for debt management. Specifically, in 74% of the cases, government debt is managed by the ministry of finance, and the remainder is split about evenly between debt management by a debt management agency or by the central bank. In 76% of the cases, there is a coordination mechanism for debt management. (Table 5 provides examples.)

Table 5

Examples of coordination mechanisms between the central bank and the government in the area of debt management

Brazil	The central bank and the ministry of finance determine and announce each year the volume of bonds to be issued. On the operational side, the central bank acts on behalf of the Treasury and carries out debt issuance transactions in the external market following the decisions taken in a coordination committee named Codex, which holds monthly meetings between the central bank and the Treasury on external debt matters.
Hong Kong SAR	The HKMA is an independent organisation with responsibility over monetary policy including the management of foreign exchange reserves, while the management of the HKSAR government's fiscal position, including the foreign currency debt, is the responsibility of the Financial Services and the Treasury Bureau. Both institutions are under the oversight of the Financial Secretary, who has overall responsibility for financial and economic policy formulation and implementation.
Hungary	<ul style="list-style-type: none"> • The central bank provides a formal opinion on the annual borrowing plan of the debt management office, especially concerning the ratio of foreign currency borrowing. • The central bank is represented on the board of the debt management office. • A contract between the central bank and the debt management office sets out the detailed division of tasks in the area of foreign currency debt management. In case of extraordinary market circumstances, the debt management office borrows on the request of the central bank to fill up reserves.
India	The government has constituted a liability management group which includes a representative from the central bank. The key objective of this group is to ensure better management of external liabilities, including prepayment of high-cost debts of the government.

¹⁹ Intervention via the expectations channel, using "open mouth operations", is left aside.

Table 5 (cont)

**Examples of coordination mechanisms
between the central bank and the government
in the area of debt management**

Malaysia	Regular meetings are conducted between institutions to discuss operational and strategic issues such as the cash flow position and projections. In addition, ad hoc meetings to discuss issues such as refinancing and bond issuance are held.
Mexico	The central bank acts as financial agent for the government and in this capacity manages some of the government's foreign assets (which are not included in the official definition of international reserves) and carries out foreign debt service on behalf of the government (operational issues only).
Philippines	<ul style="list-style-type: none"> • Membership of a government representative on the Monetary Board and membership/presence of central bank representatives in inter-agency groups or committees that are directly or indirectly responsible for managing the government's foreign currency borrowings. • Submission to the central bank by the national government and by government-owned and/or -controlled corporations, including government financial institutions, of their annual borrowing plans. • Close monitoring by the central bank of foreign exchange requirements of the public and private sectors, eg for servicing foreign currency obligations and proceeds from new loans. • Comprehensive monitoring of the country's external debt and profile (ie maturity, currency, composition, etc) vis-à-vis foreign exchange reserves.
South Africa	Separate committees with joint representation coordinate and execute the policy of the national treasury and the central bank.
Thailand	Foreign currency debt is administered by the National Debt Committee, which is chaired by the Minister of Finance. The Governor of the Bank of Thailand is a member.

In Chile and Israel there is no coordination between the central bank and the institution managing the foreign currency debt, but the central bank considers the currency composition of foreign currency debt (over a one-year horizon in Chile and a five-year horizon in Israel) explicitly when determining the currency composition of the foreign exchange reserves.

Conclusion

Governance is an important and topical aspect of institution building. Concerning foreign exchange intervention, three governance issues may be highlighted. The broadest is the allocation of powers for monetary policy and for exchange rate policy. The more narrow is decision-making on interventions at the operational level. And the third concerns transparency and accountability for the exercise of independent authority.

On the broad issue, close links between monetary policy and the exchange rate mean that policy interests in each area cannot be treated separately. Even so, it is quite common for central bank laws to obscure who has the power over exchange rate policy. At the operational level, governance arrangements for interventions are also more opaque than for monetary policy. This is notable, since interventions are often carried out in secret, and might thus need tighter governance arrangements than otherwise. Well-considered procedures are also necessary to make the best use of public funds once the decision to intervene has been taken in principle. The trading desk is best placed to assess the most effective timing and tactics, yet the many nuances of policy decision-making in this area limit the ability of those in charge of policy (Governor or Board) to delegate decision authority.

Turning to transparency and accountability, the paradigm today is that a good central bank is a transparent central bank. Foreign exchange interventions are a remarkable exception, reflecting the concern that too much transparency on interventions may impede their effectiveness. Related views and practices among central banks differ widely, but there is a shared concern to make a sufficient amount of information available at least ex post in order to facilitate the central bank being held to account for its intervention actions.

Annex 1:
**Selected information on foreign
exchange reserves and interventions**

Central bank of	Size of foreign exchange reserves (FXR)			Owner-ship of FXR %	Decision-making power for inter-ventions ²	Intervention strategy published Regularly, in case of major Changes, or No	Information on actual interventions is published			
	USD bn (mid-2004)	Months of imports	¹				Yes or No	Daily or same-day ³	Weekly or Bi-weekly	Monthly
Flexible exchange rate arrangements										
India	114	19	●	100	CB	R	N			
Indonesia	33	12	●	?	CB	N	N			
Korea	166	11	●	80	Mixed ³	N	N			
Philippines	13	4	○	100	CB	N	Some ⁴			
Singapore	101	10	●	100	CB	N	N			
Thailand	42	7	●	98	CB	N	N			
Argentina	16	14	R	100	CB	R	Y	Y	Y	Y
Brazil	50	12	●	0	CB	C	Y	Y		
Chile	15	10	R	100	CB	C	Y		B	
Colombia	11	9	R	100	CB	C	Y	Y		
Mexico	59	4	A	100	CB and G jointly	C	Y	Y		
Peru	10	15	R	51	CB	N	Y	Y		
Czech Republic	26	6	○	100	CB	R	Y	E ⁵		Y ⁶
Hungary	12	3	○	100	CB	R	N ⁷			
Poland	36	7	A	100	CB	N	N			
Israel	26	9	R	100	CB	R	Y			Y
New Zealand	3	2	○	100	CB	C	⁸			
South Africa	9	3	○	100	CB	C	Y			Y
Turkey	34	6	A	100	CB	R	N			
Fixed exchange rate or very narrow band										
Hong Kong SAR	121	6	A	0	CB	R	Y			Y
Malaysia	53	8	A	100	G after consulting CB	N	N			
Venezuela	18	25	R	97	CB	N	N			

¹ This field combines the entries in the two numeric fields on foreign exchange reserves. ● = high reserves both in absolute terms and relative to imports; A = high reserves only in absolute terms; R = high reserves only relative to imports; and ○ = a low level of reserves both in absolute terms and relative to imports. (See footnote for Tables 2a and 2b for details.) ² CB = central bank; G = government. ³ For reserves owned by The Bank of Korea, central bank after consulting government; for reserves owned by the government, government after consulting central bank. ⁴ The volume of the central bank's outstanding non-deliverable forward transactions is published on its website with a one-month lag from the reference period. Data on other forms of intervention are not published. ⁵ E = exceptionally. ⁶ Minutes of the meeting; *Inflation Report*; the central bank's website. ⁷ One exception was the announcement of the foreign exchange auctions in the aftermath of the January 2003 attack on the strong end of the band. ⁸ No guidelines established on this point.

Annex 2:
Authorization for foreign currency operations, foreign currency directive and related procedural instructions by the US Federal Open Market Committee²⁰

“By unanimous vote, the Authorization for Foreign Currency Operations was reaffirmed in the form shown below.

AUTHORIZATION FOR FOREIGN CURRENCY OPERATIONS

1. The Federal Open Market Committee authorizes and directs the Federal Reserve Bank of New York, for System Open Market Account, to the extent necessary to carry out the Committee's foreign currency directive and express authorizations by the Committee pursuant thereto, and in conformity with such procedural instructions as the Committee may issue from time to time:

A. To purchase and sell the following foreign currencies in the form of cable transfers through spot or forward transactions on the open market at home and abroad, including transactions with the U.S. Treasury, with the U.S. Exchange Stabilization Fund established by Section 10 of the Gold Reserve Act of 1934, with foreign monetary authorities, with the Bank for International Settlements, and with other international financial institutions:

*Canadian dollars
Danish kroner
Euro
Pounds sterling
Japanese yen
Mexican pesos
Norwegian kroner
Swedish kronor
Swiss francs*

B. To hold balances of, and to have outstanding forward contracts to receive or to deliver, the foreign currencies listed in paragraph A above.

C. To draw foreign currencies and to permit foreign banks to draw dollars under the reciprocal currency arrangements listed in paragraph 2 below, provided that drawings by either party to any such arrangement shall be fully liquidated within 12 months after any amount outstanding at that time was first drawn, unless the Committee, because of exceptional circumstances, specifically authorizes a delay.

D. To maintain an overall open position in all foreign currencies not exceeding \$25.0 billion. For this purpose, the overall open position in all foreign currencies is defined as the sum (disregarding signs) of net positions in individual currencies. The net position in a single foreign currency is defined as holdings of balances in that currency, plus outstanding contracts for future receipt, minus outstanding contracts for future delivery of that currency, i.e., as the sum of these elements with due regard to sign.

2. The Federal Open Market Committee directs the Federal Reserve Bank of New York to maintain reciprocal currency arrangements ("swap" arrangements) for the System Open Market Account for periods up to a maximum of 12 months with the following foreign banks, which are among those designated by the Board of Governors of the Federal Reserve System under Section 214.5 of Regulation N, Relations with Foreign Banks and Bankers, and with the approval of the Committee to renew such arrangements on maturity:

²⁰ The latest version was adopted at and published in the minutes of the January 2004 meeting of the FOMC, and is excerpted here. Source: <http://www.federalreserve.gov/FOMC/minutes/20040128.htm>. Section headings are not shown in bold in the original.

Foreign bank	Amount of arrangement (millions of dollars equivalent)
Bank of Canada	2,000
Bank of Mexico	3,000

Any changes in the terms of existing swap arrangements, and the proposed terms of any new arrangements that may be authorized, shall be referred for review and approval to the Committee.

3. All transactions in foreign currencies undertaken under paragraph 1.A. above shall, unless otherwise expressly authorized by the Committee, be at prevailing market rates. For the purpose of providing an investment return on System holdings of foreign currencies or for the purpose of adjusting interest rates paid or received in connection with swap drawings, transactions with foreign central banks may be undertaken at non-market exchange rates.

4. It shall be the normal practice to arrange with foreign central banks for the coordination of foreign currency transactions. In making operating arrangements with foreign central banks on System holdings of foreign currencies, the Federal Reserve Bank of New York shall not commit itself to maintain any specific balance, unless authorized by the Federal Open Market Committee. Any agreements or understandings concerning the administration of the accounts maintained by the Federal Reserve Bank of New York with the foreign banks designated by the Board of Governors under Section 214.5 of Regulation N shall be referred for review and approval to the Committee.

5. Foreign currency holdings shall be invested to ensure that adequate liquidity is maintained to meet anticipated needs and so that each currency portfolio shall generally have an average duration of no more than 18 months (calculated as Macaulay duration). When appropriate in connection with arrangements to provide investment facilities for foreign currency holdings, U.S. Government securities may be purchased from foreign central banks under agreements for repurchase of such securities within 30 calendar days.

6. All operations undertaken pursuant to the preceding paragraphs shall be reported promptly to the Foreign Currency Subcommittee and the Committee. The Foreign Currency Subcommittee consists of the Chairman and Vice Chairman of the Committee, the Vice Chairman of the Board of Governors, and such other member of the Board as the Chairman may designate (or in the absence of members of the Board serving on the Subcommittee, other Board members designated by the Chairman as alternates, and in the absence of the Vice Chairman of the Committee, his alternate). Meetings of the Subcommittee shall be called at the request of any member, or at the request of the Manager, System Open Market Account ("Manager"), for the purposes of reviewing recent or contemplated operations and of consulting with the Manager on other matters relating to his responsibilities. At the request of any member of the Subcommittee, questions arising from such reviews and consultations shall be referred for determination to the Federal Open Market Committee.

7. The Chairman is authorized:

A. With the approval of the Committee, to enter into any needed agreement or understanding with the Secretary of the Treasury about the division of responsibility for foreign currency operations between the System and the Treasury;

B. To keep the Secretary of the Treasury fully advised concerning System foreign currency operations, and to consult with the Secretary on policy matters relating to foreign currency operations;

C. From time to time, to transmit appropriate reports and information to the National Advisory Council on International Monetary and Financial Policies.

8. Staff officers of the Committee are authorized to transmit pertinent information on System foreign currency operations to appropriate officials of the Treasury Department.

9. All Federal Reserve Banks shall participate in the foreign currency operations for System Account in accordance with paragraph 3G(1) of the Board of Governors' Statement of Procedure with Respect to Foreign Relationships of Federal Reserve Banks dated January 1, 1944.

By unanimous vote, the Foreign Currency Directive was reaffirmed in the form shown below.

FOREIGN CURRENCY DIRECTIVE

1. System operations in foreign currencies shall generally be directed at countering disorderly market conditions, provided that market exchange rates for the U.S. dollar reflect actions and behavior consistent with IMF Article IV, Section 1.

2. To achieve this end the System shall:

A. Undertake spot and forward purchases and sales of foreign exchange.

B. Maintain reciprocal currency ("swap") arrangements with selected foreign central banks.

C. Cooperate in other respects with central banks of other countries and with international monetary institutions.

3. Transactions may also be undertaken:

A. To adjust System balances in light of probable future needs for currencies.

B. To provide means for meeting System and Treasury commitments in particular currencies, and to facilitate operations of the Exchange Stabilization Fund.

C. For such other purposes as may be expressly authorized by the Committee.

4. System foreign currency operations shall be conducted:

A. In close and continuous consultation and cooperation with the United States Treasury;

B. In cooperation, as appropriate, with foreign monetary authorities; and

C. In a manner consistent with the obligations of the United States in the International Monetary Fund regarding exchange arrangements under IMF Article IV.

By unanimous vote, the Procedural Instructions with Respect to Foreign Currency Operations were reaffirmed in the form shown below.

PROCEDURAL INSTRUCTIONS WITH RESPECT TO FOREIGN CURRENCY OPERATIONS

In conducting operations pursuant to the authorization and direction of the Federal Open Market Committee as set forth in the Authorization for Foreign Currency Operations and the Foreign Currency Directive, the Federal Reserve Bank of New York, through the Manager, System Open Market Account ("Manager"), shall be guided by the following procedural understandings with respect to consultations and clearances with the Committee, the Foreign Currency Subcommittee, and the Chairman of the Committee. All operations undertaken pursuant to such clearances shall be reported promptly to the Committee.

1. The Manager shall clear with the Subcommittee (or with the Chairman, if the Chairman believes that consultation with the Subcommittee is not feasible in the time available):

A. Any operation that would result in a change in the System's overall open position in foreign currencies exceeding \$300 million on any day or \$600 million since the most recent regular meeting of the Committee.

B. Any operation that would result in a change on any day in the System's net position in a single foreign currency exceeding \$150 million, or \$300 million when the operation is associated with repayment of swap drawings.

C. Any operation that might generate a substantial volume of trading in a particular currency by the System, even though the change in the System's net position in that currency might be less than the limits specified in 1.B.

D. Any swap drawing proposed by a foreign bank not exceeding the larger of (i) \$200 million or (ii) 15 percent of the size of the swap arrangement.

2. The Manager shall clear with the Committee (or with the Subcommittee, if the Subcommittee believes that consultation with the full Committee is not feasible in the time available, or with the Chairman, if the Chairman believes that consultation with the Subcommittee is not feasible in the time available):

- A. Any operation that would result in a change in the System's overall open position in foreign currencies exceeding \$1.5 billion since the most recent regular meeting of the Committee.*
- B. Any swap drawing proposed by a foreign bank exceeding the larger of (i) \$200 million or (ii) 15 percent of the size of the swap arrangement.*
- 3. The Manager shall also consult with the Subcommittee or the Chairman about proposed swap drawings by the System and about any operations that are not of a routine character.”*

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Foreign exchange market intervention: methods and tactics

David Archer

Introduction

This paper focuses on the methods and tactics of foreign exchange market intervention with an emphasis on how the tactics of intervention can depend on intervention objectives and the environment. The paper highlights the main features of the survey responses provided by emerging market central banks on questions of the methods and tactics of intervention. Links are drawn to other information about methods and tactics of foreign exchange market intervention.

King (2003), amongst others, makes the point that different objectives should involve different intervention methods and tactics. Yet there is a considerable degree of consistency in the actual choice of mechanics across the emerging market group covered by the BIS survey undertaken for this meeting. This consistency appears not only within the emerging market group, but extends also to developed countries.¹ Specifically, spot transactions predominate; they are conducted with those counterparties that operate in the deepest part of the market; and at times when the market is most liquid. And where other intervention techniques are used, such as auctions of option contracts, by design the central bank is also operating where the market is thickest.

Given the need to select methods and tactics to maximise the effectiveness of intervention, at one level it is perhaps surprising that most central banks choose to transact at a time and place where their relative size is minimised. At another level, however, the choice to operate in the thickest part of the market reflects the importance that central banks attach to avoiding volatility and to maintaining credibility.

The main area where different approaches and different attitudes are evident relates to the visibility of intervention operations. This issue is given special attention.

As background, at the outset the channels through which intervention is thought to influence the exchange rate are discussed. Subsequently, choice of markets in which intervention takes place, the preferred degree of visibility of intervention, and the choice of instrument and transaction method are addressed in turn. Finally, some thoughts are offered on intervention size, frequency and timing. It is perhaps around these issues that the general preference for plain vanilla operations becomes most apparent.

Methods and tactics: some background considerations

Foreign exchange market intervention involves trying to change the value that market participants put on a particular currency. How to do this is not immediately clear, particularly as the foreign exchange market is far from homogeneous.

High-frequency, high-pressure foreign exchange trading by market-making professionals is the part of the market most actively reported. In this market, prices seem able to be disturbed by even quite inconsequential pieces of news with little evidence of fundamental determinants working to establish an equilibrium value.

For cross-border investors with medium- to long-term investment horizons, on the other hand, the immediate and near-term pressure of order flows on market-makers' open positions is almost irrelevant. What matters is the likely accumulation of such foreign exchange flows over the investment

¹ Judging from the description of foreign exchange market intervention tactics contained in the papers associated with the Jurgensen Report (1983), there has also been a high degree of consistency of tactical choice-making over time.

horizon. With this focus, economic fundamentals are likely to be more relevant.² Even so, the short-term relationship between economic fundamentals and exchange rates is notoriously imprecise; simply extrapolating recent trends might be better (or less bad) than attempting to predict such developments from analysis of fundamentals. Some investors with medium-term horizons might thus turn to auto-regressive and “technical” prediction methods, which are certainly cheaper than fundamentals analysis in terms of time and effort. Order flow information might also be useful for cost-effective insights into the interaction between fundamentals and exchange rate behaviour. However, order flow information is most readily available to market participants least able or willing to use it - the institutions engaged in clearing customer orders. Such institutions typically operate with tight limits on net open foreign exchange exposures. In general, firms specialising as market-makers seek to make their income from “clipping the ticket” (crossing the bid-ask spread and generating fee income) and do not commit enough risk capital to provide for large speculative positions to be taken.

The vast numerical majority of participants in the market, however, are firms engaged in commerce across currency boundaries, or financing their business in international capital markets, or investing in assets denominated in different currencies. They relate to the market as price-takers. Over time, their willingness to use those currencies will depend on the profitability of their cross-currency business, and change with variations in that profitability. It is through this mechanism that economic fundamentals of competitiveness and macrobalance will eventually shape exchange rate trends. It is these forces that fundamental investors are trying to anticipate.

Finally, at least some of these agents just discussed will be attempting to second-guess the interests and behaviour of the others, adding to the complexity of the exchange rate determination process. Against that complex background, central banks must choose operational methods that effectively influence this heterogeneous group’s collective valuation of the currency. Economic theorists have attempted to identify the channels through which central bank actions might influence such valuations.

Channels of influence

The most commonly discussed channels of influence are:

1. The **monetary policy** channel. A potentially important influence on the exchange rate is the relationship between interest rates at home and abroad. Changes in real interest rate differentials caused by monetary policy actions tend to move the exchange rate, especially if unanticipated. This can be a welcome addition to the transmission of monetary policy actions to the economy. At times, however, the authorities would prefer a different balance of transmission channels; that is, a different balance of monetary conditions as between interest rates and the exchange rate (see, for example, Holub’s discussion with respect to the Czech Republic’s experience in this volume).

However, the focus of these papers is mostly on sterilised intervention.³ In first-order terms, therefore, the monetary policy channel is in principle “closed” for the purpose of this discussion. In practice, however, there is rarely a clean distinction between sterilised and unsterilised intervention (see the accompanying paper *Domestic implications of forex market intervention* and Canales-Kriljenko (2003) for further discussion). Moreover, there are important second-order linkages from sterilised intervention back to the monetary policy channel. These linkages operate through the existence of policy trade-offs - whereby inflation and real economy developments both enter the objective function of the monetary authorities - and through expectations of how those trade-offs will affect future policy.

2. The **portfolio balance** channel. Viewed from the perspective of a representative investor in an international portfolio of assets, a change in the relative scarcity of domestic versus

² Interestingly, the literature on the usefulness of order flows for explaining exchange rate developments suggests that the flows themselves may contain information on the diverse array of otherwise unobservable behaviours shaping the macroeconomic fundamentals (Evans and Lyons (2004)). The point is that what matters for medium- to longer-term investors is the future shape of the fundamentals that will in turn shape exchange rate behaviour (see also Engel and West (2004)).

³ Noting, however, that in some countries monetary policy is implemented via the foreign exchange market, with sterilisation being contingent on achieving the exchange rate objective. Hong Kong SAR and Malaysia are cases in point. In Singapore, the objective of policy is price stability, but the exchange rate is a contingent operational target.

foreign currency assets will cause a portfolio reallocation that changes relative prices in the process. One of those relative price changes might be the exchange rate.

Until a few years ago, the general consensus was that this channel is rather weak. For a start, at least in the context of large and well developed financial systems, only very small changes in the relative scarcity of domestic and foreign assets can be induced by sterilised intervention. The intervention capacity of the central bank is just too small compared with the total quantum of domestic and foreign assets that might be exchanged for each other. Empirical research has tended to lend weight to this argument. More recent research, however, is somewhat more open to the possibility that the exchange rate can be influenced by foreign exchange market interventions through changes in the relative scarcity of imperfectly substitutable assets, even in developed country cases.⁴

In addition, it is possible that in smaller, less well developed financial systems, the scale of a central bank's intervention capacity is comparatively large relative to the set of substitutable assets, as argued by Galati and Melick (2002). In relative terms, emerging market foreign reserve holdings tend to be bigger than in the average developed economy, Japan excepted.. And the degree of substitutability tends to be lower, as reflected in higher risk premia on emerging market domestic currency debt.⁵

It is worth highlighting one subset of actors in the foreign exchange market whose portfolios might readily be disturbed by intervention, perhaps especially in less well developed markets. They are the specialist foreign exchange market intermediaries noted above, the banks and other dealers who, by virtue of limited willingness or capacity to bear risk, react quickly to disturbances to their portfolios. Constraints on their willingness or ability to absorb new flows show up as reductions in the *liquidity* of the market, and associated exchange rate volatility. However, there is a tendency in the literature to discuss the role of such intermediaries in relation to a different channel of influence ("order flow", see below).

3. The **signalling** or **expectations** channel. Intervention might change perceptions of one or more of the factors that are relevant to different groups of market participants. Perceptions of future relative scarcities, of future income streams and of risk can and do change prices without a single transaction taking place.

Some discussions of signalling concentrate on signals of *future monetary policy*,⁶ and there is some evidence that it is through changed expectations of future monetary policy that exchange rates are influenced.⁷ Other discussions of signalling allow for unspecified signals of the future course of *exchange rate policy*. The literature on speculative attacks suggests that such signals can be powerful, but with the direction of influence depending crucially on the credibility of the signal. In general, a central bank's signals of determination to resist currency appreciation might be more credible than signals of resistance to depreciation.

Another component of the signalling or expectations channel relates to coordination failure, meaning the propensity for exchange rates to deviate for extended periods from their

⁴ Dominguez and Frankel (1993); Sarno and Taylor (2001).

⁵ Particularly where formal restrictions - eg authorisation or prior reporting requirements - or informal restrictions - eg understandings that large transactions will be notified to the central bank prior to execution - limit substitutability in the very short term. Such restrictions are more common in emerging market economies: a recent IMF survey (Canales-Kriljenko (2003)) shows that nearly half of emerging market economies prohibit residents from holding foreign currency denominated financial assets abroad or making payments to each other in foreign currency; one third and one quarter respectively prohibit non-residents from receiving domestic currency loans or denominating domestic financial contracts in domestic currency; and a quarter have some form of verification requirement for forward market contracts to check their connection with an underlying current or capital transaction.

⁶ Attention to this was drawn by Mussa in 1981 and featured prominently in the thinking of the Jurgensen Working Party's report in 1983. However, as Truman (2003) points out, if the effect of foreign exchange market intervention on exchange rates comes through signals about monetary policy, it is monetary policy rather than intervention that is doing the work.

⁷ Sarno and Taylor (2001), for example, conclude that intervention is likely to be more effective if it is consistent with the underlying stance of monetary and fiscal policy. If monetary policy is not related to intervention in a predictable way, however, this link is weakened. Such may be the case in some emerging market economies. Domaç and Mendoza (2004) found that monetary policy signals in Mexico and Turkey do not seem to affect the level or volatility of the exchange rate.

equilibrium values because of trading dynamics akin to those observed in asset market speculative bubbles. If autoregressive (trend-following, momentum) trading strategies are dominant enough, even those traders who are aware of probable disequilibrium may take positions that reinforce the disequilibrium.⁸ Why bet against the herd if one expects the herd instinct to dominate for the period of exposure?⁹

In this view, central bank intervention could serve to disrupt extrapolative trading, or persuade the “swinging voter” that equilibrating forces are likely to dominate. In this sense, intervention might coordinate trading in the direction of equilibrium.¹⁰ The central bank in effect gives voice to people’s half-formed views, or consolidates their expectations, in a way that has a material effect on behaviour. Hence this channel would perhaps best be described as the **coordination** channel.

4. The **order flow** channel (sometimes described as the microstructure channel). Over the last decade or so, increasing attention has been paid to the details of financial market structure and practice. Microstructure researchers have used data from banks and infrastructure providers on the detailed flow of orders and tick price movements, which are now available on an extremely high-frequency basis. They have discovered that there is a relationship between order flow and subsequent price action that is different from the relationship between trading volumes and price action, and has better predictive qualities than the relationship between news releases on conventional fundamentals and subsequent price action.¹¹

Market professionals are perhaps able to detect from order flow patterns forces that are relevant to the exchange rate, and act on that information in a way that helps shape exchange rate behaviour. Central banks may be able to alter order flows with their own orders. If market professionals react more powerfully to changes in the order flow pattern that are presumed to originate from commercial entities rather than the central bank, anonymous and secret interventions may be more powerful.

Under this mechanism, the size of intervention relative to market turnover is important, suggesting that this channel may be more effective in emerging market economies where markets are less liquid. As documented by Ho and McCauley (2003), foreign exchange markets in most emerging market economies do tend to be relatively small with bid-ask spreads that appear to be less uniform (both across currencies and through time) and wider than those in industrial economies.¹² This indicates less liquidity. Moreover, in emerging market economies, central banks may have better access to information on flows.

On the other hand, for the order flow channel to work as postulated, the market professionals who have an insiders’ view of the flows must be active in driving exchange rate developments and not just passive participants in the process. In most countries, the market-makers (bank or non-bank dealers, typically) do not take significant risk positions, but instead just clear flows within tight self-imposed limits on net open positions. Indeed, in many markets it would be inconsistent with market convention for the market-makers to “front-run” the new orders of commercial customers.

With these possible channels of influence as background, we now turn to a discussion of the choices on tactics and methods that central banks face in practice when intervening.

⁸ Frankel and Froot (1990); Taylor and Allen (1992).

⁹ Evans and Lyons (2002b) observe that autoregressive trading within the interbank market tends to be mean-reverting rather than extrapolative. However, transaction flows of end holders of foreign exchange risk tend to be positively autocorrelated (Lyons (FAQs)).

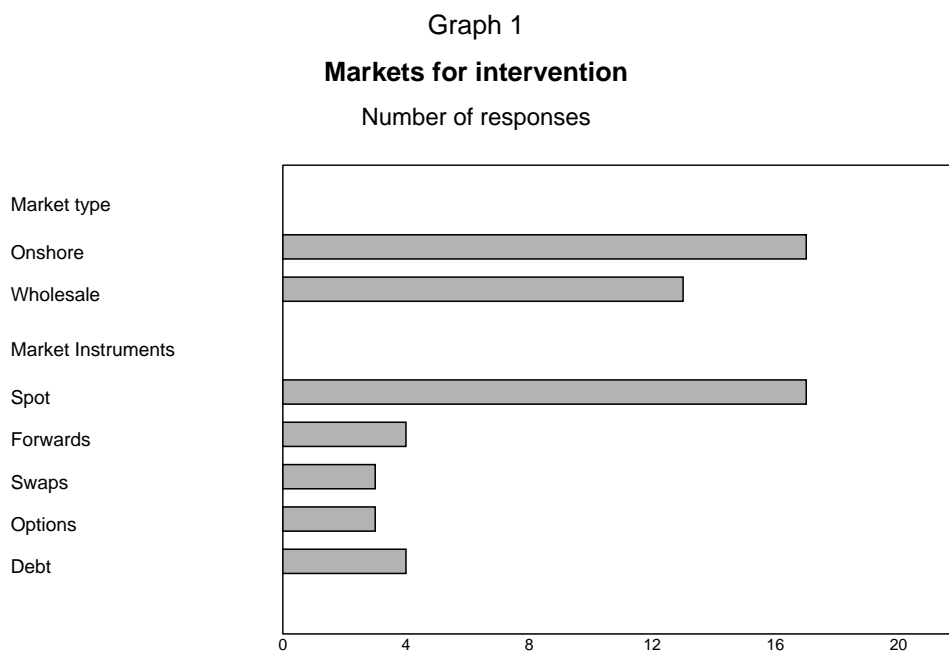
¹⁰ Sarno and Taylor (2001, pp 862-3) provide useful discussion of the conceptual basis for this channel of influence.

¹¹ See Evans and Lyons (various) for contributions to and surveys of this literature. Scalia (2004) is an example of an empirical application of the microstructure perspective to intervention in an emerging market context (the Czech Republic).

¹² Foreign exchange market institutions in emerging market economies may also tend to be more fragmented than in developed markets. The numbers of banks and bureaus operating in the foreign exchange markets of emerging market economies can be very large. Brazil, for example, reported just over 400 foreign exchange dealers in 2001, with 30 of those operating as market-makers (Canales-Kriljenko (2003)).

Choice of markets

In a survey of a large number of developing and emerging market economies conducted in 2001, the IMF reported that the very great majority - 82% - of intervention in emerging market economies is conducted in the spot market (Canales-Kriljenko (2003)). The results of the BIS survey show the same dominance of the spot market, with the additional flavour that it is the onshore, wholesale spot market where the vast majority of interventions take place (Graph 1). The main reasons given were either that the onshore wholesale spot market is “the” market - the alternatives do not exist in any material sense - or that it is in that market where liquidity is greatest.



Consistent with liquidity being an important consideration to the central banks in the sample, most mainly intervene in their own time zone (Table 1 below). Indeed, the only example where another time zone was reported as regularly being used for intervention is Hong Kong SAR, which is a special case in the sense that “intervention” is effectively passive and automatic, driven by the currency board arrangements. The London and New York time zones are only used if banks with clearing accounts at the HKMA want to transact Hong Kong dollars for US dollars in those centres, in which case the local offices of the HKMA are available. Support for the currency board arrangement on a 24-hour basis helps the arbitrage process keep the Hong Kong interest rates/exchange rate combination consistent with maintenance of the peg.

In a similar vein, a clear majority of intervention is conducted during normal business hours, in order to be transacting when the market is deepest and at its most liquid (Table 1).

As discussed above, some research suggests that one of the potentially more powerful channels of influence would seem to be utilising market frictions to engineer an outsize price response. Given these frictions, interventions that are small in scale - when assessed against the total volume of assets that are substitutable across currencies over time - can simultaneously be large in scale - when assessed in terms of the relationship between order flow and daily risk-bearing capacity. Once a price reaction has been engineered, achieving persistence requires repeat interventions, extrapolative (autocorrelated) dynamics, and/or a change in market views as to the relevance of economic fundamentals.

In the light of this, then, what explains the evident preference for interventions at times and places where the frictions are smallest? Five possibilities (at least) come to mind. The first and most obvious of course is that central banks that intervene do not share the inference drawn from research that these microstructure/market dynamics channels are effective in achieving the desired objective.

Second, if central banks were on the other hand successful in generating an outside price response by utilising these mechanisms, intervention might add to very high-frequency volatility, in the same way that any “lumpy” transaction or flow can disturb pricing in a thin market.¹³ For many central banks, one of the main purposes of intervention is to dampen volatility, and in general most central banks would regard additional volatility as a costly side effect.¹⁴

Third, for those central banks that prefer to remain anonymous when intervening, transacting in the thinnest part of the market is likely to attract the greatest attention.

Fourth, for those central banks that actively use the signalling channel, either to indicate likely monetary policy attitudes to continued exchange rate trends or to coordinate views around the implications of economic fundamentals for the rate, transacting in thin markets might be seen as counterproductive to the effectiveness of the signalling. The choice of illiquid market could be interpreted as a sign of weakness or desperation and therefore an indication that the central bank’s views should be ignored.

Finally, in some cases there really is no alternative - the onshore, wholesale, normal hours, spot market is all that is really available.

Table 1

Implementation aspects of intervention

	Intervention timing			Time zone		Preferred visibility	
	Mainly business hours	Occasionally outside business hours	Visibility relevant to choice?	Own time zone	Another time zone also	Visible	Invisible
Number of responses	16	4	0	17	2	6	4

Source: Central bank responses to the BIS questionnaire.

Visibility

A curious feature brought to light by surveys of different approaches to foreign exchange intervention is the sharp difference of views on the extent to which visibility of intervention is desirable. Part of this question relates to issues of governance and accountability, which is discussed elsewhere (see the Moser-Boehm paper in this volume). Part is also tactical in nature. Some central banks believe that visibility brings greater effectiveness; some the opposite.

It should be noted at the outset that central banks from time to time seek invisibility precisely in order to minimise their impact on the exchange rate. Where the prime objective is to build reserves, or rebuild reserves after an earlier intervention, it may be that there is no subsidiary objective of depressing the currency. In such situations, the purchase of reserves may be undertaken quietly. Reserve acquisition exercises in South Africa and Australia are cases in point. In other countries, such as Turkey and Mexico, reserve acquisition may be highly visible but also highly predictable in order to minimise the effect on the exchange market. And central banks in many countries will switch between

¹³ There is some empirical evidence suggesting that central bank foreign exchange market interventions increase the high-frequency volatility of the exchange rate (see Disyatat and Galati, in this volume).

¹⁴ See the results of the BIS survey, reported in Mihajek in this volume.

quiet and highly visible interventions depending on the circumstances and the objectives of the moment.

None of the central banks in the BIS survey indicated that the choice of the timing of intervention, relative to normal market hours, was related to a desire for visibility or invisibility. Some, however, indicated a general preference for visibility, and some a general preference for tactical secrecy (Table 1).

Why is it that some central banks prefer visibility, some the opposite? The arguments in the literature in favour of transparency seem powerful. They include: the evidence that the signalling and coordination channels - channels which operate through publicity - are relatively important; awareness of the motivations of the authorities minimises the noise that would be introduced by policy uncertainty; consistency with transparency in other elements of public policy; and a basis for accountability.

For these reasons, a number of central banks structure interventions so as to ensure transparency. In Colombia and Mexico, for example, most interventions are conducted via auctions with preannounced quantities that are in turn triggered by published formulas related to the behaviour of the exchange rate. In Chile and Turkey, auctions are also used for some operations, in large part in order to make interventions transparent. In other countries, such as Peru, intervention operations are explicitly intended to be visible, so that the signalling channel is utilised to the fullest. Argentina prefers transparency so as to reinforce the credibility of the new exchange rate arrangements, differentiating intervention under the new arrangements from intervention under previous arrangements (see the discussion in Irigoyen's paper in this volume). In yet other cases where the exchange rate regime depends on central bank intervention - the currency board in Hong Kong SAR and the exchange rate peg in Malaysia are the main examples - the visibility of the central bank is essential in order to align expectations with the continuation of the peg.

On the other side, several counterarguments in favour of secrecy have been adduced by, *inter alia*, Dominguez and Frankel (1993), Enoch (1998), Neely (2000), Sarno and Taylor (2001), Chiu (2003) and King (2003). The list includes the desire to minimise the impact of intervention when the central bank does not want to intervene but is instructed to do so by the relevant decision-making authority; cases where the central bank expects to fail; where intervention is inconsistent with other policy objectives, hence confusing signals will be given; and where the central bank is not sure what it wants to achieve. Intervention in such cases would, however, be inconsistent with most understandings of best practice.¹⁵ Other possibilities include a desire to obtain the best price when transacting (Enoch (1998)).

Two factors that may be especially important to central banks seeking to intervene quietly are:

1. **Risk of speculative attack**

Under fixed-but-adjustable peg exchange rate regimes, an announced exchange rate target provides a clear level that the authorities are obliged to defend. Accordingly, strict secrecy about limits to the authorities' ability to hold the peg seems to be the norm. The 1990s, with the ERM crisis in 1992 and the Asian financial crisis in 1997, provided numerous examples of speculative attacks on currencies where those limits had been threatened, and consequential expectations of possible devaluation had reached critical levels.

The use of the label "speculative attack" is not intended to be pejorative, conveying the sense of a deliberate and coordinated effort by a group of agents to overthrow a policy setting or arrangement. Although some degree of explicit coordination might occur in some circumstances, in the majority of cases individuals and companies are likely to be acting independently to protect themselves against losses or obtain gains from expected changes in the exchange rate. Coordination is implicit, with the coordination device being the shared views of the implications of macroeconomic or other information for the probability of an exchange rate change.

Under managed floating, there is no such hard and fast level. Hence speculative attack dynamics are less likely to arise as the exchange rate can adjust to reflect today's pressures,

¹⁵ Canales-Kriljenko and Karacadağ (2003) provide a discussion of best practice for intervention.

reducing the predictability of tomorrow's exchange rate movement.¹⁶ However, intervention that acts to slow down the adjustment of a floating exchange rate could increase its predictability. If the intervention is expected to be effective in the short run but not in the longer run, an accelerated movement to catch up with the trend can be anticipated once intervention ceases. Hence information about the fact of intervention and limits to intervention capacity or willingness might draw speculative attacks. The paper by Érsek in this volume describes Hungary's experience with speculative attacks in 2003, which motivated a switch to covert intervention.

For this reason, central banks with managed floats may also be keen to avoid attracting destabilising speculation, and prefer secrecy with respect to their presence when intervening, and especially in respect of any limits associated with the intervention. Exceptions to the general principle of full transparency are often regarded as acceptable when it comes to foreign exchange operations.¹⁷

2. Use of the **order flow channel**

Hung's (1977) argument that central banks seeking to use the order flow channel to affect the exchange rate will prefer invisibility has been accepted by several subsequent contributors to the literature. The idea is that if professional traders observe a flow of orders initiated by market players, they will assume the presence of some quasi-fundamental driver - not the central bank - and initiate positions of their own that reinforce the direction of movement. A central bank might therefore want to disguise its presence by using an agent bank that is sworn to secrecy. Chiu's (2003) finding that those central banks that intervene most frequently tend to be less forthcoming in disclosing their interventions could be consistent with this argument, given that frequent interveners are more likely to be seeking to utilise order flow dynamics than central banks that intervene infrequently.¹⁸

Some commentators, however, reject the argument that secrecy helps harness the power of the order flow channel. King (2003), for example, suggests that private sector agents will learn to detect the attempts of central banks to clothe their operations in secrecy, if there is money to be made by doing so. As official data on intervention have become available, it has become possible to assess the accuracy of press and market commentator reports of intervention - the results are mixed. Nonetheless, with more countries now adopting disclosure practices that are consistent with SDDS, the time frame over which interventions can feasibly remain secret is probably diminishing.

The value of secrecy when using the order flow channel can also be questioned on more fundamental grounds. Investment banks, money market funds, pension funds, hedge funds and other large speculative players who take significant positions in foreign exchange markets typically do not have direct access to information about the identities behind flows. That information is privy to the market-makers, who take and clear orders from customers, but who, as previously noted, typically do not take large speculative positions. In other words, if there is value in information on the identities behind order flows, that information tends to be most available where it is least likely to be used.

There are numerous examples of central banks seeking invisibility during interventions. Canales-Krijlenko's (2003) survey reported that around half of developing and transition economy central banks did not announce their presence in the market when intervening.¹⁹ (Central banks in the

¹⁶ Meese and Rogoff's famous (1983) finding that a naive random walk outperforms other exchange rate forecasting models is consistent with this line of thinking. Predictability might, however, still be present in floating exchange rate cases for other reasons. For example, if the exchange rate displays asset price bubble characteristics, recent trends may become useful predictors of the near future. Woo (1987) provided early evidence of speculative bubbles in developed country foreign exchange markets.

¹⁷ More discussion of these issues is contained in the paper by Moser-Boehm in this volume. See also Chiu (2003).

¹⁸ To illustrate, the Bank of Japan has in recent years adopted an intervention style that emphasises large-scale, infrequent interventions. At the same time, the Bank of Japan has concluded that secret interventions do not work well (Ito (2004)).

¹⁹ Canales-Krijlenko detected some association between preference for invisibility and pegged or crawling band exchange rate regimes. Some of the reported preference for invisibility might therefore be associated with concerns to avoid attracting destabilising speculation.

BIS survey were not always explicit about their preferences, making a comparison with Canales-Krijlenko's results difficult.)

The authorities in Indonesia and South Africa, amongst others, indicate a preference for not being seen when intervening. The Monetary Authority of Singapore avoids disclosure of the limits of the exchange rate range that has been determined to be consistent with achieving the inflation target. In several other countries, including the Czech Republic, Korea and Poland, the authorities indicate that contemporaneous disclosure is determined on a case by case basis. Mainly seeking flexibility, the Reserve Bank of Australia added an extra layer of anonymity during an intervention in 1998 by taking out option positions (via an agent bank) that would require option market-makers to initiate new spot market orders in order to hedge their own positions against the risk that the options would be exercised (Reserve Bank of Australia (1999)).

Choice of instrument

The financial instrument of choice for intervening central banks is a **spot** foreign exchange transaction. Graph 1 above shows how little use is made of forwards, derivatives and cross-currency debt instruments, although there are important examples of the use of each.²⁰ Again, the logic of the case for exploiting market frictions to maximise the size of the effect on prices might have suggested that more use would be seen of the less liquid markets for intervention. Few clues were provided by survey respondents as to the reason for the concentration on plain vanilla spot transactions. However, this topic has been addressed by others, with the following considerations being highlighted:

- Some have noted that intervention by way of forward contracts afforded a greater measure of secrecy, for longer, than intervention by way of spot contracts. There is, however, only tentative support for the use of forward contracts as a way of hiding intervention in the current survey. Survey responses showed only a limited correspondence between those countries that report themselves as preferring anonymity and those which report using forward contracts as an instrument of intervention.

Growing preference for transparency has reduced one motivation for the use of forwards. Also relevant is the fact that several countries (eg New Zealand in 1984, South Africa in the second half of the 1990s, Thailand in 1997) had bad experiences with the use of forward contracts. Because a forward contract does not require immediate funding, and because it offers the tantalising prospect of being able to close out before settlement - which might also be after the intervention objective has been achieved - political pressures to defend a particular exchange rate have sometimes led to large and ultimately costly forward books being built. Precisely those attributes that make for secrecy also reduce the constraints on overuse of the instrument.²¹

- **Swaps**, like forwards, defer the cash flow impact of the intervention relative to the cash flow that would be associated with a spot transaction. In contrast with the forward, however, with a swap some of the cash flow is spread out over the term of the contract. For some central banks and counterparties, this spreading of credit risk over multiple time buckets has advantages in relation to use of risk limits. Bank Indonesia and the Reserve Bank of India use the swaps market from time to time.
- **Options** have been used tactically in the past by central banks (for example, Australia, in 1998). Options are currently being used strategically by Colombia and Mexico to achieve a clear and transparent mapping of intervention to objective. Chile has also used options in this manner.

²⁰ This appears to be somewhat in contrast with the result reported in Neely's 2000 survey of foreign exchange market intervention by central banks. Around half of the respondents to that survey reported sometimes using the forward market for intervention. The overlap between survey populations is not complete (Neely's survey population included developed countries), and the words used in the questions are not identical. Thus the inconsistency may be more apparent than real.

²¹ Although this need not be the case. Accrual accounting and modern risk management methodology place forward contracts on an even footing with spot transactions in terms of transparency and the ability to assess risk.

Tactical use of options bears some similarities with use of forward contracts. Both forms of contract require little or no immediate funding. Both also allow interventions to be undertaken with greater secrecy, at least for a period. In the case of options, the anonymity derives from the fact that so long as the option counterparty maintains client confidentiality, all that the market observes is a flow of (probably) spot transactions as the option counterparty seeks to hedge their exposure against the changing risk that the option will be exercised. Thus, as the exchange rate moves towards the strike price, the option seller will accelerate hedging operations, entering the spot market in the direction that is consistent with the central bank's objective.

As with forward contracts, however, these particular characteristics come with associated dangers. Understanding the risk characteristics of the collection of contracts entered into requires more care with options than with spot transactions.²² And secrecy can also reduce the constraints on politically inspired but economically or financially dangerous interventions that publicity would otherwise rule out.

These problems are unlikely to arise with the strategic approach to the use of option contracts as implemented in Colombia and Mexico.²³ In both cases, the central bank sells option contracts under well publicised auction rules. The combination of option instrument and auction method means that market participants choose the price at which the option contract is dealt, and the extent to which the options (puts, in the case of appreciation; calls, in the case of depreciation) are exercised. This structure transparently introduces an element of automatic stabilisation into the market, while making available to the private sector a more complete set of hedging instruments than might otherwise exist. As implemented in Colombia and Mexico, the option strategy has been used to build foreign exchange reserves at a pace that alters with the amount of pressure on the currency - faster reserve acquisition in conditions of more rapid appreciation - where the change in pace is determined by option holders rather than the central bank.

- One definition of foreign exchange market intervention is any transaction that alters the net foreign currency position of the public sector for policy, or non-commercial reasons. That definition broadens the focus beyond changes in the foreign currency asset position of the central bank to the overall portfolio of the central bank and other public sector agencies. Included within this broadening are **debt operations** that have a foreign currency exposure implication.

Government debt can be issued in a variety of cross-currency forms, including full or partial foreign currency *denomination*, and full or partial *indexation* to a foreign currency. Including some component of foreign currency denomination or indexation in a debt instrument is similar in effect to intervening by way of swap transactions.

Active use of adjustments to currency denomination and indexation of debt instruments has been an aspect of Latin American foreign exchange market operations, but the technique is not used elsewhere. Brazil, in particular, has systematically switched denomination structures as between periods of calm and crisis, responding both to incentives to reduce funding costs when currency risk premia alter, and to concerns to make hedging instruments available to a nervous private sector (Mori (2004)). At various times, Chile, Mexico and Peru (in 2002 especially) have also used debt denomination/indexation as a intervention instrument.

- **Verbal intervention**, or “open mouth operations”, is apparently not used often by the central banks in this sample. One central bank noted that it used verbal intervention only once in the past three years, when its governor and the chairman of the banking supervision agency jointly warned domestic banks to manage their foreign exchange risks and watch their open foreign exchange positions.

²² Blejer and Schumacher (2000) discuss the issues that follow from central bank use of derivatives.

²³ See Ramirez (2004) and the references therein for details of intervention through options in Colombia.

In sharp contrast, some countries have made very active use of verbal intervention to assist their efforts to alter exchange rate behaviour. In Japan, for example, there have been many examples of Ministry of Finance spokesmen publicising the official view on the behaviour of the exchange rate. Moreover, as would be anticipated, modern empirical research points to the power of announcement effects, thus requiring careful disentanglement of data on announcements from data on actions when evaluating the effect of intervention.²⁴

A paper provided by the Central Bank of Chile highlights the potential value of structured communications - a strong form of open mouth operations - in achieving an influence on the exchange rate (de Gregorio and Tokman, in this volume). The paper provides clear empirical support for the power of the mechanism when the central bank is credible. In relation to the interventions in 2001, for example, the announcement of a preparedness to intervene - coupled with an explicit statement of the resources available for intervention and the time frame over which intervention might take place - is estimated to have led to an appreciation of nearly 3%. Yet the estimated effect of the actual interventions that followed the announcement is insignificantly different from zero.

The transparency of the intervention strategy in Chile in 2001 is also interesting for another reason. As discussed earlier, one of the motivations for secrecy is to avoid giving speculators a target to "attack" - limits to the authority's resources are normally presumed to be such a target. In this case, at least, transparency was clearly beneficial.

- **Moral suasion** was also noticeably absent from the list of instruments reported by central banks responding to the BIS survey. In Neely's (2000) survey of developing and transition economies, however, nearly a quarter of the central banks surveyed reported using moral suasion as an intervention tool. The absence from our survey of responses possibly reflects the fact that no direct question was asked about the use of moral suasion, rather than a change in practice since Neely's survey was conducted.

Choice of transaction method

In most markets, several different means of conducting transactions are available to central banks seeking to influence the exchange rate. The options include:

- Transacting directly - usually by telephone - with market-makers. In such cases, the central bank is operating as would a corporate customer of the market-maker, calling to request to be quoted a bid and offer price, then transacting at the quoted price.
- Transacting with a voice broker's customers (typically market-makers, but in some cases large corporates and financial institutions may also have access to the broker) via the broker's service. In such cases, the price called by the broker can be accepted ("hit") by the central bank, or, less commonly, the central bank can make a (two-sided, bid and offer) price itself with the broker and wait to be hit, adjusting the price as required in order to motivate a market-maker to hit the price.

Such transactions differ from transacting directly with a market-maker in that the price is made before the market-maker knows that the other party is the central bank. If the market-maker was aware of the identity of the counterparty from the outset, and had formed the view that the central bank was intervening rather than undertaking regular business, the (two-sided) price might be adjusted in anticipation of a difficulty in clearing the position with other market-makers. This difference, however, would be very short-lived. Once this market-maker had become aware that their price had been hit by the central bank undertaking a presumed intervention, future quotes registered with the broker would be adjusted accordingly. The difference would not have a large impact on the market-maker's overall position, since the standard parcel size for transactions via the broker is relatively small in order to limit exposure to such risk.

²⁴ See Disyatat and Galati in this volume for a more complete discussion.

- Transactions can be undertaken with market-makers (and others who have access) via an electronic broker, where such a system exists. Differences between the transactions via voice brokers and via electronic brokers are very small, at least in respect of the issues relevant to the nature and effectiveness of foreign exchange market intervention. However, in some cases central banks may be able to use information on the flow of prices posted at the electronic broker to assess the most propitious moment to intervene (as discussed in the next section).
- In many countries, electronic trading platforms exist. These are functionally a blend of telephone price-making by market-makers and broker systems, in that market-makers quote two-way prices to the system without knowing the identity of the potential counterparty that might hit the price.

Such systems allow the central bank to pick and choose between different bids and offers, which from time to time might provide a tactical advantage if they are also aware of the likely individual positions of the market-makers. For example, in some countries (Brazil, Colombia, Hungary, Korea, Peru, the Philippines, South Africa and Turkey) central banks daily conduct formal or informal surveys of market-makers' net open positions, and have other information relevant to assessing likely positions. The trading platform itself might be configured to provide information to the central bank on the current flow of orders yet to be transacted. Choosing to transact with a bank that is closer than the others to its risk limits could have a more powerful impact on the subsequent price action associated with that bank clearing its position in the market. Certainly, as the accompanying paper on *Survey of central banks' views on effects of intervention* discusses, the majority of central banks believe they have an informational advantage that can be tactically useful when intervening (in contrast to the conventional assumption of the literature).

- Conducting auctions, ie inviting bids from counterparties chosen with reference to a range of factors, including settlement risk and their track record in supporting market liquidity. Auctions can set the quantity and allow the price to be market-determined (as in Colombia and Mexico), or vice versa. Auctions fit well with a strategy in which the central bank wants to maintain transparency, assure neutrality as between individual counterparties, and indicate a willingness to allow market determination of the exchange rate.

The transaction types listed above all allow for the central bank's presence in the market to be visible, if not immediately to all participants, at least within a short time frame. Other transaction types provide for less visibility:

- Transacting directly - usually by telephone - with large corporates which normally undertake their transactions with market-makers. In such cases, the central bank may be aware through its information networks of large transactions that are imminent. A negotiated price might be reached that motivates the corporate to deal with the central bank rather than the market, or in some markets moral suasion might be used to achieve the same effect.

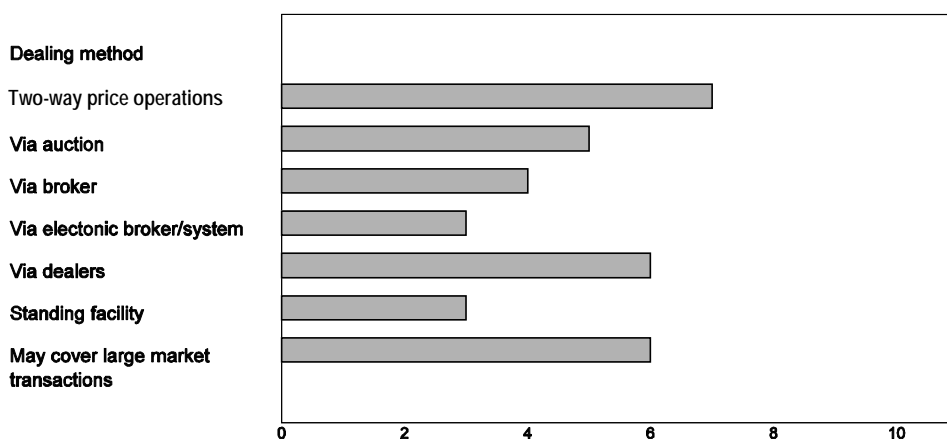
In some cases, special facilities may be established for off-market transactions with a certain class of market participants, such as Mexico established (via the deposit insurance agency) for banks facing credit line closure and (directly) for holders of tesobonos in 1995. Treatment of petroleum revenues in large petroleum-exporting countries (eg Norway and Mexico) is similar. While the existence of such facilities is usually public knowledge, their use is often privileged information.

- Transacting via agents. An agent, such as a large commercial bank (that may or may not also be a market-maker in the foreign exchange market), might be given a mandate to transact up to specified quantities within specified price limits. Secrecy will often be required by the central bank, so that the market transactions appear to other market participants as if they had been induced by corporate business. Because the granting of the mandate to a single player has the potential to convey commercially valuable information, the requirement for secrecy is likely to be respected. Equally, because the arrangement conveys some privilege to the agent bank, it is common that the choice of agent bank is rotated around the qualifying candidates in pursuit of neutrality.

Amongst the respondents to the BIS survey, there was no clear predominance of any particular dealing method, as Graph 2 indicates. Choice of dealing arrangement seems to depend largely on the technology available to the market, with those technologies that offer the greatest access to

information and greatest liquidity being used ahead of the other options. As to the issue of visibility, the majority of those central banks that indicated a preference for anonymity also indicated that they will occasionally deal directly with large corporates (public sector as well as private sector) in off-market transactions. But the sample size is too small to draw any strong associations.

Graph 2
Markets for intervention
 Number of responses



Choice of intervention size, frequency and timing

The paper by Mihaljek in this volume discusses central banks' perspectives on the effectiveness of intervention, including whether effectiveness is influenced by the size of intervention. A large range of transaction sizes was reported as being used, as would be expected given the range of objectives for intervention. Where reserve accumulation with minimum effect on the exchange rate is the objective, a pattern of frequent but individually small interventions (or options-based mechanisms, as discussed above) would be expected. Where influencing the exchange rate is the objective, larger and accordingly less frequent interventions might be expected.

Under the heading of "larger and less frequent", however, there are several possibilities. In the last year, the Japanese authorities have, for example, reportedly taken the view that *very large and frequent* interventions are noticeably more effective than large and infrequent (Ito (2004)). Certainly, Japanese intervention during 2003-004 was on an unprecedented scale at USD 320 billion (7% of GDP). The survey responses suggest that central banks in the emerging market economy that report intervening less frequently in smaller amounts tend to view interventions as more likely to be successful than those that report intervening less frequently in larger amounts.

Another tactical issue involves the question of the **timing of interventions relative to the positioning of market participants**. As discussed earlier, a potential way to effect exchange rate behaviour is influencing the actions of agents who use technical analysis as the dominant tool for making investment decisions. Here the issue is not size, but the effective use of size to shift the exchange rate trend observed by technical analysis for long enough to induce changes in private sector positions. This is similar in nature to harnessing the favourable power of private sector expectations, except that here the expectations are formed purely from the recent history of the exchange rate itself.

Around half of the respondents to the BIS survey indicated that they actively observe the information required to effectively utilise technical-based trading patterns to their advantage. Such information includes the critical levels that technical analysis packages calculate; market positioning (for example, net long or short positions in the local foreign exchange market, or in international markets such as the Chicago Board of Trade, where reports are available on the positioning of international money market accounts and others); and typical stop-loss levels used by these market participants. The point about

these key market levels is that once they are breached, the new trades initiated by market participants using technical trading methods will tend to reinforce the direction of movement - whether those trades are designed to follow the trend or to recover from breaking a stop-loss limit.

However, even though the majority of survey respondents observe information on key market levels, and see a case for using the information in this way, just three report actively using such information to aid decisions on the timing of interventions. As before, this suggests that central banks tend to eschew tactics that might add to short-term volatility and raise questions that bear on credibility.

Reinforcing a favourable trend is another technique that central banks use to harness the support of market participants using technical-based trading techniques. In recent interventions, the Bank of Japan has reportedly traded in the same direction as the market once the exchange rate trend had turned in their preferred direction - "leaning with the wind" rather than against. Such an approach is also contemplated by the Reserve Bank of New Zealand, which recently announced a preparedness to intervene (having eschewed intervention since the float of the New Zealand currency in 1985). The New Zealand authorities have set out four criteria that need to be met before intervention can take place: the exchange rate must be exceptionally high or low relative to its trend; that level must be unjustifiable in terms of economic fundamentals; intervention must be consistent with the monetary policy objectives as set out in the Policy Targets Agreement; and there must be a reasonable expectation of being able to influence the exchange rate in the direction of equilibrium. In their view, these criteria mean that the Reserve Bank "would intervene at opportune times, not when the currency's direction is being dominated by strong international trends or consensus opinions" (Orr (2004); see also Eckhold and Hunt in this volume). Although those criteria do not rule out interventions against the exchange rate trend where it is judged likely that the intervention would successfully affect the trend, it seems more likely that interventions based on these criteria would seek to accelerate the return of the exchange rate towards equilibrium.

The distinction between interventions "with" and those "against the wind" highlights the circumstance- and objective-dependent character of foreign exchange market interventions and the tactics used by central banks. By successfully leaning with the wind, a central bank will increase the volatility of the exchange rate in some dimensions, but shortening the time that the exchange rate remains away from trend will reduce another (cyclical) dimension of volatility. And by choosing sometimes to reinforce a favourable trend and sometimes to fight against an unfavourable one, a central bank is making operational decisions based on a combination of policy and market-dynamic considerations that would be difficult to capture in any intervention rule book.

Concluding remarks

Central banks from emerging market economies these days have considerably more experience with foreign exchange market intervention than their developed country counterparts. The range of techniques and tactics deployed is clearly wider than has been the case with intervention by developed economies over the last three decades or so. That is especially the case in three areas: the use of direct controls, consistent with the stage of development of many of these financial markets; the sale of option contracts by auction; and the use of foreign currency debt denomination or indexation as a supplementary tool (the latter two techniques featuring in Latin America). However, the great majority of intervention across the group takes conventional forms, with spot transactions in the most liquid part of the wholesale market predominating.

Although intervening central banks within the emerging market group tend to rate their interventions as quite successful, and although they devote substantial resources to monitoring their foreign exchange markets, in general they are loathe to attribute success to the selection and use of "clever" tactics. To be sure, a number of instances can be found where monitoring procedures have helped with the timing and structure of intervention. But equally, the view to be obtained through intensive monitoring remains murky and the ability to predict outcomes remains limited. As one participant at the meetings suggested, the selection of technique and tactics is an ongoing process of adaptation with no small amount of trial and error.

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Intervention: what are the domestic consequences?

M S Mohanty and Philip Turner¹

Introduction

The conventional wisdom is that central banks can intervene in foreign exchange markets to resist currency appreciation for some time because there is no simple, clear ceiling to the volume of domestic currency they can sell in forex markets. Equally conventional is the view that prolonged, large-scale intervention must eventually weaken domestic macroeconomic performance - whether because of higher inflation, the costs of misaligned exchange rates or distortions in the financial system or the exchange rate/maturity exposures built up by the public sector. Yet massive intervention during the five years 2000 to 2004 by the major emerging market central banks - especially Asian central banks - has not apparently had such negative effects. Indeed, inflation has been low, financial systems appear stronger and there has been sustained growth. What has happened? This paper seeks to answer this question.

The main reason for policy dilemma is that intervention in the foreign exchange market has direct implications for the stance of monetary policy. In some circumstances, the central bank may want *both* to resist currency appreciation *and* to ease monetary policy. If so, intervention would create no conflict with monetary policies. If not, the central bank would have to ensure that money market rates are held constant in the face of intervention; some would express this alternatively in terms of holding the monetary base broadly unchanged. This is the process of sterilisation.²

When intervention in the foreign exchange market (and the corresponding operations in money markets) are small, or where net positions tend to reverse quickly, preserving the stance of monetary policy through sterilisation operations will be comparatively easy. But as interventions become larger, or go on for longer in one direction, the conflict between monetary and exchange rate objectives becomes progressively harder to resolve. Financial markets come more and more to suspect that official targets for interest rates and for exchange rates are inconsistent - and that, sooner or later, one of these objectives must give. Difficulties are: (a) distortions may be created in the financial sector; and (b) heavy financing costs may be incurred by the authorities.

The rest of the paper is organised as follows. Section 1 discusses the recent experience of intervention, highlighting in particular the main differences between the current episode and two earlier periods of heavy intervention by emerging market central banks (1990-93 and 1995-96). Section 2 explores the implications for monetary policy. Section 3 examines the consequences and costs of prolonged intervention. While Section 4 deals with the choice of instruments, Section 5 concludes.

¹ The paper is based on the information provided by the central banks. We are thankful to David Archer, Piti Disyatat, Ramon Moreno, Toshitaka Sekine and Goetz von Peter for very useful comments; to Michela Scatigna, Gert Schnabel and Marjorie Santos for statistical help; and to Clare Batts and Monica Mauron for excellent secretarial assistance.

² The Jurgensen report (1983) provides a formal definition: "sterilized intervention (on the basis of a broader definition) means a change in the monetary authorities' net foreign currency assets which is offset by a corresponding change in their net domestic assets, so that their monetary liabilities (or, specifically, the monetary base) remain unchanged. If, on the other hand, the change in the authorities' net foreign assets is accompanied by a corresponding change in their monetary liabilities (so that, for instance, a reduction in foreign currency reserves would result in a reduction in the monetary base), the intervention is said to be unsterilized". The operation generally involves a two-step process. In the first step, the monetary authority buys foreign currency assets by crediting cash to commercial banks' accounts. This increases bank reserves beyond the normal settlement cash and compulsory reserve requirement, if any, that banks are required to keep with the central bank, temporarily raising the monetary base. In the second stage, the central bank sells domestic assets (assumed to be government bonds) from its portfolio through an open market operation, and banks use their excess deposit to settle securities purchases from the central bank. This restores bank reserves and monetary base to the original equilibrium, preventing an unwarranted easing of monetary policy. This is sterilised intervention, the net effect of which is a change in the composition of domestic and foreign currency assets with the public.

1. Recent experience

Nature of foreign inflows

The accumulation of reserves for emerging markets as a whole over the period 2000-04 has generally reflected current account surpluses, rather than heavy capital inflows. This is the opposite of the pattern seen in the 1990s - when the aggregate current account balance for the emerging world as a whole was negative and capital inflows large. Table 1 provides the aggregate regional magnitudes, while the country detail is given in Table A1 in the Annex. Most of the smaller East Asian economies actually had net capital outflows during 2000-04. Major oil-exporting countries (Algeria, Venezuela and Russia) have generated large surpluses. Nevertheless, capital inflows have been large in China,³ India and Korea. Although net capital inflows to Latin America as a whole remains far below the level seen during the early 1990s episodes, they have played a substantial role in Brazil and Mexico during the past four years. In central Europe, heavy capital inflows exceeded current account deficits.

Faced with these inflows, one response of countries may be to intervene to prevent the exchange rate from appreciating. Such a choice depends in part on the nature of the shock. For instance, a temporary inflow might require intervention whilst a more permanent change might demand currency appreciation. The response might also be different depending on whether pressure on the exchange rate is coming from the current account (which might respond in a stable and predictable way to currency appreciation) or from the capital account (perhaps less easily amenable to the exchange rate?). There are of course many other dimensions of possible shocks.

How far the recent inflows are more *permanent* than the inflows seen in the early 1990s is difficult to judge. Current account positions tend to be less volatile than capital balances, although the present surpluses of some oil-exporting countries are temporary. Capital inflows in the 1990s were often driven by high nominal interest rates on local debt securities - and were therefore inherently volatile. More recent inflows (eg FDI) have perhaps been more permanent - or at least more stable.

Table 1
Capital flows, current accounts and intervention¹

	Net capital flows			Current account balance			Change in reserves		
	1990-1993	1995-1996	2000-2004 ⁶	1990-1993	1995-1996	2000-2004 ⁶	1990-1993	1995-1996	2000-2004 ⁶
Asia, large ²	46	119	350	28	-18	354	18	47	649
Asia, other ³	81	70	-206	-32	-40	285	75	16	88
Latin America ⁴	128	100	77	-86	-64	-67	57	-10	44
Central Europe ⁵	-3	23	85	-6	-13	-74	9	11	24
Developing countries, total	326	332	238	-170	-165	513	164	59	922

¹ In billions of US dollars. ² Sum for China, India, Korea and Taiwan (China). ³ Sum for Hong Kong SAR, Indonesia, Malaysia, the Philippines, Singapore and Thailand. ⁴ Sum for Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. ⁵ Sum for the Czech Republic, Hungary and Poland. ⁶ Up to September 2004.

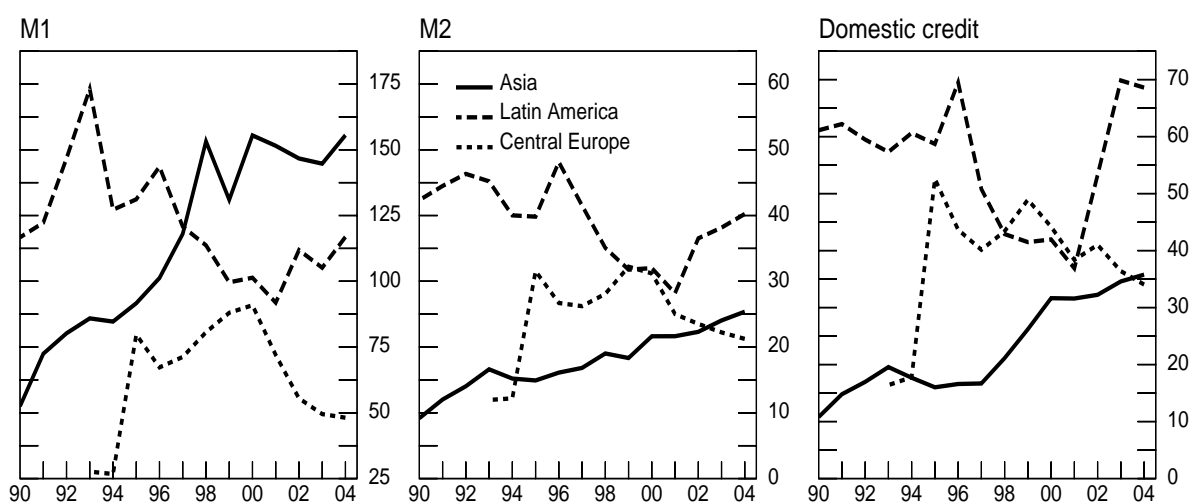
Sources: IMF, *Balance of Payments Statistics*.

³ Ma and McCauley (2004) provide several reasons for the recent increase in non-FDI inflows into China. A steady fall in the differential between the onshore dollar deposit rate and the renminbi deposit rate to negative levels since 2001 has led Chinese residents to reduce their long dollar positions in favour of renminbi deposits and firms to increase their foreign currency borrowing. Such a trend may have been further reinforced by the expectation of a future revaluation of the fixed exchange rate, increasing the profitability of long renminbi/short dollar positions. One indicator of the rise in short-term inflows into China has been the reversal of errors and omissions in the balance of payments from annual average outflows of about \$14 billion since 1995 to 2001 to inflows of over \$13 billion in 2002 and 2003; see Xie (2004).

Scale of intervention

In the 1990s, the foreign exchange reserves of developing countries as a group were a small percentage of the volume of cash in the hands of the public. The monetary authorities in many countries therefore did not have to issue interest-yielding securities on a large scale to finance reserve accumulation. The financial implications of intervention were consequently limited. One simple indication of this is the movement in the difference between the local currency value of foreign reserves and currency held by the public, which rose from less than \$30 billion in Asia at the end of 1990 to over \$780 billion at the end of 2004 and from \$44 billion to \$139 billion in Latin America. In particular, the gap increased sharply in China from –\$38 billion to \$227 billion during this period and in Korea from \$5 billion to \$169 billion.

Graph 1
**Foreign reserves minus
 currency held by the public**
 As a percentage of



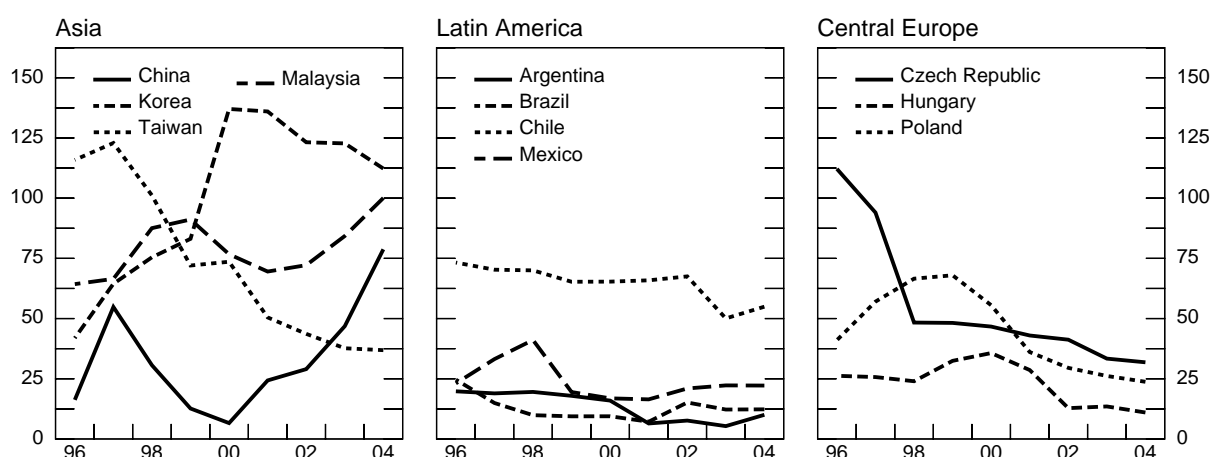
Sources: IMF; national data.

The movement in this gap is also large in relation to some simple measures of the size of the financial system - such as M1, M2 or domestic credit as shown in Graph 1. For instance, this gap (foreign reserves minus currency with the public) to broad money reached over 25% of M2 in Asia at the end of June 2004 compared with 9% at the beginning of the 1990s. In some Asian countries such financing gaps are much higher (see Annex A2). In Latin America, reserves were a high proportion of monetary aggregates in the first half of the 1990s. Since then, however, reserves have grown less rapidly in relation to currency with the public, with the financing gap declining since the mid-1990s until about 2002.

Another way to look at the scale of intervention is to compare the excess of foreign reserves over currency to the outstanding stock of public sector debt securities (Graph 2). The ratio has risen sharply in many Asian economies, exceeding, for instance, 70 to 100% in China, Korea and Malaysia. The central bank financing gap has thus accounted for a very large part of the available stock of risk-free securities in the economy. Such ratios have also risen in Brazil, Chile and Mexico during the past two years or so. In central Europe, however, the volume of debt issuance has been much higher than reserve accumulation.

Graph 2

Foreign reserves in relation to outstanding debt securities¹



¹ Calculated as the ratio of foreign reserves net of currency in circulation over outstanding public sector debt securities.

Sources: IMF; national data; BIS statistics.

2. Coordination with monetary policy

A first challenge the monetary authority faces is to coordinate intervention with monetary policy. As discussed in the paper by Disyatat and Galati in this volume, sterilised intervention could be effective through the portfolio balance channel (by affecting the relative scarcity of imperfectly substitutable assets) or through the signalling channel (for instance, by influencing expectations of future exchange rate or other policies).⁴ But the close coordination with monetary policy that sterilised intervention assumes may not be easy to achieve in practice. At least three major potential problems can be identified:

- (i) *Monetary policy and exchange rate objectives may be inconsistent.* The monetary authorities will find it harder to prevent appreciation pressure while at the same time raising the interest rate. Israel's experience during the mid-1990s demonstrated such a dilemma (Elkayam (2004)). The Bank of Israel's attempts to keep the exchange rate within a narrow band while raising the interest rate to fight domestic inflation pressures attracted more capital inflows, pushing the exchange rate further towards the stronger side of the band. The central bank finally gave up its resistance to appreciation in favour of the inflation objective by considerably widening the stronger side of the exchange rate band in 1997.
- (ii) *"Distraction risk".* Truman (2003) argues that the authorities might be tempted to postpone fundamental adjustments hoping that intervention will succeed. He shows that during the late 1970s intervention against a weak dollar was primarily used as a substitute for monetary tightening in the United States. But the delay in tightening monetary policy eventually led to a sharp rise in inflation and the need to raise interest rates to a very high level. The tighter monetary policy, in turn, led to one of the worst recessions in US postwar history.

⁴ In the limit, when uncovered interest rate parity (UIP) holds, sterilised intervention ceases to be an additional policy instrument: a lower exchange rate in the spot market means that the domestic interest rate must fall given investors' expectations about future appreciation.

- (iii) *Sending the wrong signal about monetary policy.* Intervention to resist appreciation might confuse the market when the central bank is raising interest rates to fight inflationary pressure. There is a danger that exchange rate policy might dominate monetary policy.⁵

In view of these challenges, what can be done to achieve better coordination?

One suggestion has been that intervention should be restricted to cases where it is consistent with the central bank's inflation forecast. For instance, intervention to resist depreciation should be accompanied by the forecast that inflation would - if depreciation occurred - rise above the target during the targeting horizon. Conversely, the central bank would intervene to resist appreciation only when inflation is forecast to fall below the target. Holub (2004) argues that in the Czech Republic such coordination has been maintained since the introduction of inflation targeting in 1998: most interventions against currency appreciation were carried out when (a) inflation was expected to fall below the target and (b) the output gap was negative.

Similarly, the Reserve Bank of New Zealand has recently proposed to intervene only against excessive *medium-term* swings in the exchange rate, when those swings cannot be explained by fundamentals. The criteria for interventions also require that they be consistent with the inflation objective. Interventions to limit exchange rate variations would, if necessary, be offset by greater interest rate variations to maintain monetary conditions appropriate for achieving the inflation target.⁶

Thus decision-making with respect to intervention is obliged to pay attention to the coordination issue, and in this monetary policy objectives are paramount. Archer (2004) provides a rationale for intervention under such criteria. In a small open economy, the exchange rate might play a dominant role in the monetary transmission mechanism from policy rates to output and inflation.⁷ Intervention would seek to temper further appreciation pressures at the peak of the exchange rate cycle in order to stimulate activity in the tradable sector, while monetary policy would move into a tighter mode to restrict further expansion in the non-tradable sector. Similarly, moving towards the trough of the exchange rate cycle, intervention would restrict further expansion in the tradable sector but stimulate the domestic economy through a lower interest rate.

Limits to sterilised intervention

A second question concerns the ability of monetary authorities to conduct sterilised intervention on a sustained basis. What are the limits to sterilised intervention? At least three major impediments have been discussed in the literature. This section outlines such impediments in general terms and subsequent sections consider their practical importance in the current situation:

1. *The impossible trinity - the central bank cannot indefinitely control both the nominal exchange rate and the money market rate.* This is the classic argument of Mundell (1968). In the case of intervention to prevent depreciation, such a limit will be often set by the reserves and contingency credit lines available to a country. Depleting reserves, at some stage, will make an interest rate increase inevitable. The limit on intervention to prevent appreciation is, however, less clear cut because reserves can keep rising. It could be argued, however, that resisting currency appreciation would prevent the domestic money market interest rate from falling, attract more inflows and thus continuously increase the need for sterilisation. Eventually, the cost of sterilisation would rise to high levels, leading either the interest rate to fall or the exchange rate to appreciate.⁸ In the long run, therefore, appreciation becomes

⁵ See Truman (2003), who cites the remarks by Gerald Corrigan expressing concern about a conflict of objectives in the United States during the 1989-90 intervention episode when the government was trying to weaken the dollar while the Federal Reserve was tightening monetary policy.

⁶ The Reserve Bank has also proposed another precondition, that intervention should be expected to have an effect on the exchange rate (see the paper by Eckhold and Hunt in this volume).

⁷ In New Zealand's case a relatively high interest rate differential has been associated with strong capital inflows, rapid appreciation of the exchange rate and large declines in tradable good prices. Archer (2004) argues that in such circumstances a combination of intervention and policy rate adjustment would help to achieve a balanced income growth in the tradable and non-tradable sector, to the extent that interventions were successful.

⁸ Mundell (1968) shows that sterilisation policy is inconsistent because it prevents the money supply and nominal income from rising to restore equilibrium in the goods and asset markets. The constraint, according to him, is that "if the central

unavoidable because even in the former case the resulting increase in money supply and inflation will lead to an appreciation of the *real* exchange rate.⁹

In the previous episodes, large-scale sterilised intervention had indeed led to sharp increases in short-term interest rates - particularly in countries with a history of inflation. Reinhart and Reinhart (1999) document evidences during the early 1990s.¹⁰ In Chile the short-term interest rate (30- to 89-day bank lending rate) rose from about 28% in the period (1988-89) preceding capital inflows to over 46% during the period (January to July 1990) of heavy inflows and sterilisation. The rise in interest rates was as dramatic in Colombia, with prime lending rates of banks more than doubling from 22% during the pre-inflow period (1989-90) to over 47% during the peak of sterilisation (January to November 1991).¹¹ Such rate increases were also pronounced in Korea, Malaysia and Indonesia. Reinhart and Reinhart (1999) conclude that “sterilization policies were either abandoned or scaled back or complemented by capital controls, as it became evident that the high domestic interest rates were attracting more inflows”.

Note, however, that in low-inflation countries (where the running costs of holding reserves is low or even negative) that appreciation pressures can, at least from the perspective of this argument, be resisted for a considerable period of time.

2. *Imperfect substitutability among assets means that changes in the supplies of such assets as a result of sterilisation affects relative prices.* Classic models (eg Argy and Murray (1985) and Argy (1994)) typically assume that the central bank sells domestic bonds to sterilise. If domestic bonds (whose yield carries a risk premium) are imperfect substitutes of foreign bonds, the authorities would have to pay higher interest rates on their sterilisation bonds to encourage bondholders to switch out of foreign bonds.¹² Moreover, such impacts may be heightened in the face of several other imperfections in local markets.¹³ Examples include: illiquid bond markets; lack of sufficient substitutability between domestic assets in investors' portfolio; and the concentration of capital inflows on only certain financial market segments (see Turner (1991), Frankel (1993) and World Bank (1997)). For instance, capital inflows may be concentrated in equity markets while central banks sell their own paper to sterilise such inflows. If asset holdings of the non-financial private sector were perfectly substitutable, it would be expected to sell equity and willingly buy additional claims on the central bank, increasing the assets demanded by foreigners. In the absence of such an adjustment, the interest rate on central bank securities may rise substantially to restore the portfolio equilibrium.

bank sells securities at the same rate as it is buying reserves it cannot buy reserves at a rate fast enough to keep the exchange rate from appreciating. And if the central bank buys reserves at a rate fast enough to stabilise the exchange rate, it can not sell securities fast enough to keep the money supply constant” (p 255).

- ⁹ Frankel (1993) extends this model to study the impact under different types of shocks. The main argument is that sterilisation is difficult when the cause of the capital inflows is a rise in investors' confidence in the economy, raising their demand for monetary assets. Attempts to sterilise capital inflows to maintain a constant money supply in such cases would raise interest rates, leading to larger inflows. On the other hand, when the source of capital inflows is an external shock such as a decline in the foreign interest rate, sterilised intervention can be a viable option in the short run. While capital inflows will continue to respond to positive interest rate differentials, the problem will be contained by the fact that such a shock leaves the level of the domestic interest rate unaltered.
- ¹⁰ Nevertheless, such increases need also to be viewed in the context of the overall macroeconomy. To the extent that some countries witnessed overheating pressures, higher interest rates may have reflected the stance of monetary policy rather than sterilisation alone. Separating the two effects is difficult in the absence of proper econometric controls.
- ¹¹ See Griffith-Jones et al (2001) and Reinhart and Dunaway (1996) for a description of several similar episodes of sterilised intervention during the early 1990s.
- ¹² However, if nothing else changes, higher domestic bond rates might encourage a switch out of money and into bonds, leading to a subsequent fall in the interest rate.
- ¹³ In principle, the theoretical limit for sterilised intervention may be higher in emerging market economies than in the industrial economies. Such a finding is supported by empirical estimates of offset coefficients, which tend to be lower in the former than the latter group of countries; see, for example, Kouri and Porter (1974) and Fry (1993). With their greater integration with international financial markets in recent years the offset coefficients may have increased in a number of emerging market economies, reducing the scope of sterilisation. Moreover, the practical limits to sterilisation may be much lower in emerging market economies because investors may demand a large risk premium on their domestic assets, given the higher probability of default and illiquid markets for such debts.

A general point that several participants in the meeting stressed is that the demand for domestic assets is affected by the nature of the forex inflow that gives rise to the forex intervention. Where financial markets are thin (or the scale of intervention very large), differences between the assets supplied by the central bank in sterilisation and the assets demanded (eg by non-residents in the case of a capital inflow) can affect relative asset prices.

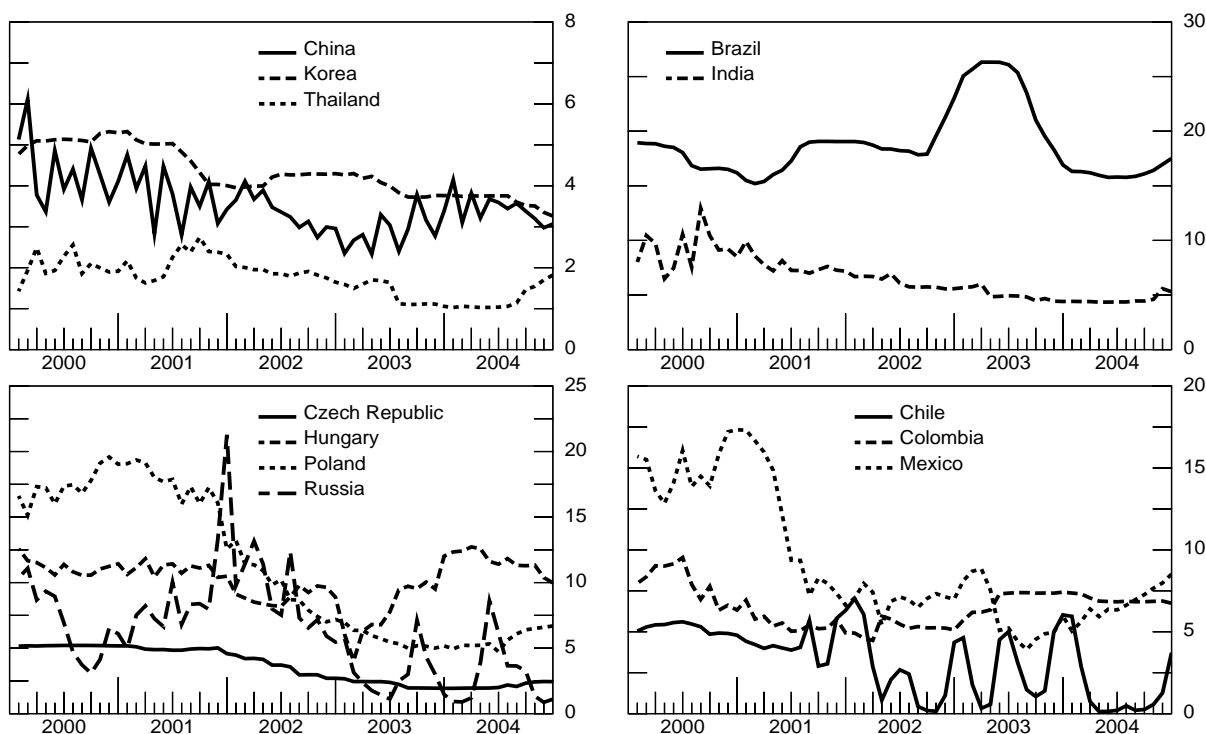
3. *The high costs of issuing high-yield local currency debt to acquire low-yielding reserves can exacerbate fiscal deficits and so threaten macroeconomic stability.* This can be particularly serious in countries that already have large public sector debts. In some circumstances, the combination of high costs and increasing reserves may provide a signal to markets that policy is on an unsustainable path and so accentuate destabilising capital flows.

Calvo (1991) argued that such effects would eventually weaken central banks' anti-inflation credibility by raising the spectre of debt monetisation and high inflation. Comparing the high interest rate differentials of Chile and Colombia with Argentina, which followed a policy of non-sterilised intervention during the early 1990s, Calvo et al (1993) cast serious doubts on the desirability of sterilised intervention because it raised debt service costs at a time when countries were attempting to bring domestic debt expansion under control. Similarly, Velasco and Cabezas (1999) attribute much of the origins of the 1994 Mexican crisis to the large stock of short-term Cetes and Tesobonos issued by the government for sterilising capital inflows. They argue that "the presence of a large stock of non-indexed debts kept alive in investors the fear that the Mexican government would eventually return to a high-inflation policy to reduce the value of outstanding liabilities".

The actual significance of these impediments can be minimised by a careful selection of instruments of sterilisation or switching to non-market instruments. Their use and implications are discussed in Section 4 of this paper.

Graph 3

Short-term interest rates



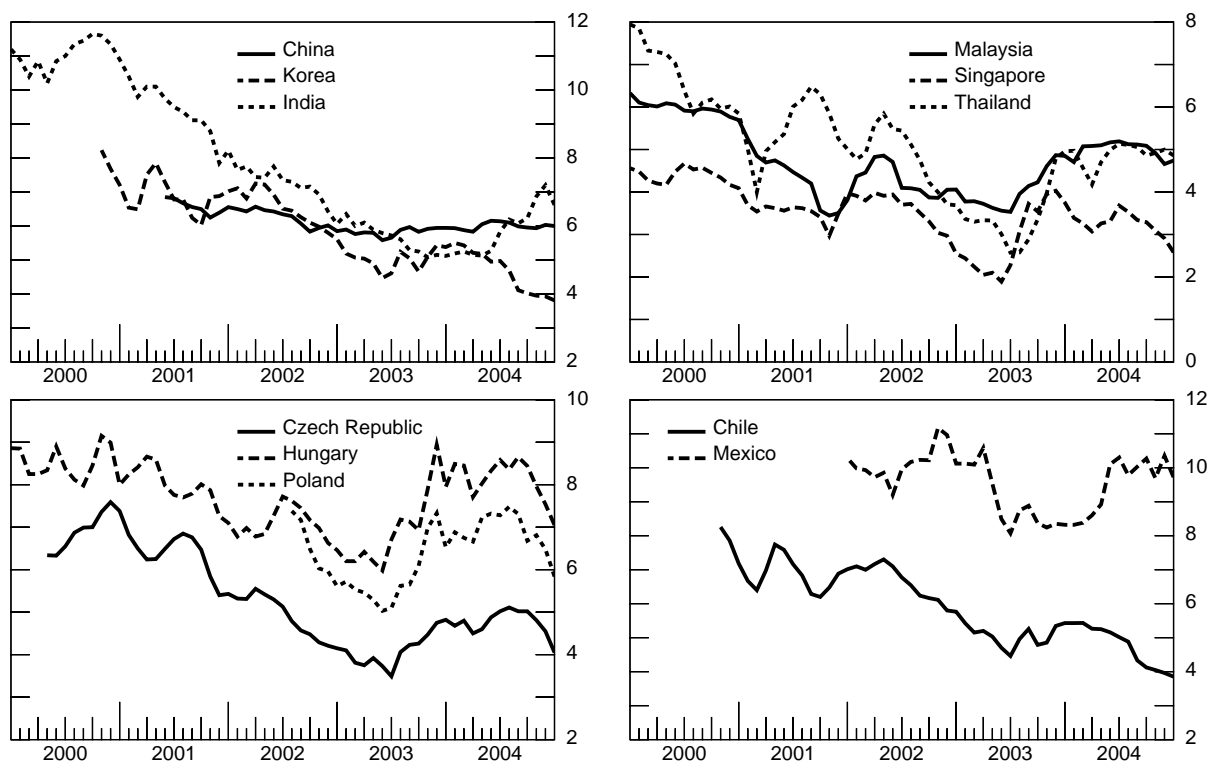
Source: National data.

3. Three possible consequences of prolonged sterilised intervention

The sterilisation of prolonged or very large intervention *could* eventually have three consequences: it could undermine monetary objectives; it could compromise financial stability; and it could impose heavy financing costs on the monetary authorities. This section examines how far the current situation raises such risks.

Focusing on the first issue, the nature of monetary challenges in the current cycle has varied from the previous experience. In the past, inflation risks often meant the authorities were unwilling to countenance the lower short-term interest rates that intervention entailed. In the more recent episode, by contrast, many countries accumulating reserves actually wanted an easier monetary policy stance. Low inflation and large output gaps especially following the 2001 global economic slowdown had led many Asian central banks to cut interest rates to stimulate domestic demand. As a result, short-term interest rates have fallen or remained low throughout Asia during the past four years (Graph 3). The picture appears to be broadly similar in a number of countries in central Europe and Latin America. The decline in long-term bond rates has been even steeper, particularly in Korea, India and Singapore (Graph 4).

Graph 4
Long-term interest rates¹



¹ Ten year treasury bond yields.

Source: National data.

An additional factor is that some countries, at least at the beginning of the current cycle, have seen greater risk aversion among banks, increasing their demand for safer assets and thus putting downward pressures on long-term bond rates. In India, for example, such a flight-to-quality behaviour has meant that banks have been more than willing to invest in government securities (or indeed other sterilisation instruments) at a low interest rate. By the middle of October 2004 banks held more than 39% of their total liabilities in government bonds, far exceeding the minimum statutory liquidity requirement of 25%. Such effects remain significant in several other economies in Asia (for example, Korea) and Latin America.

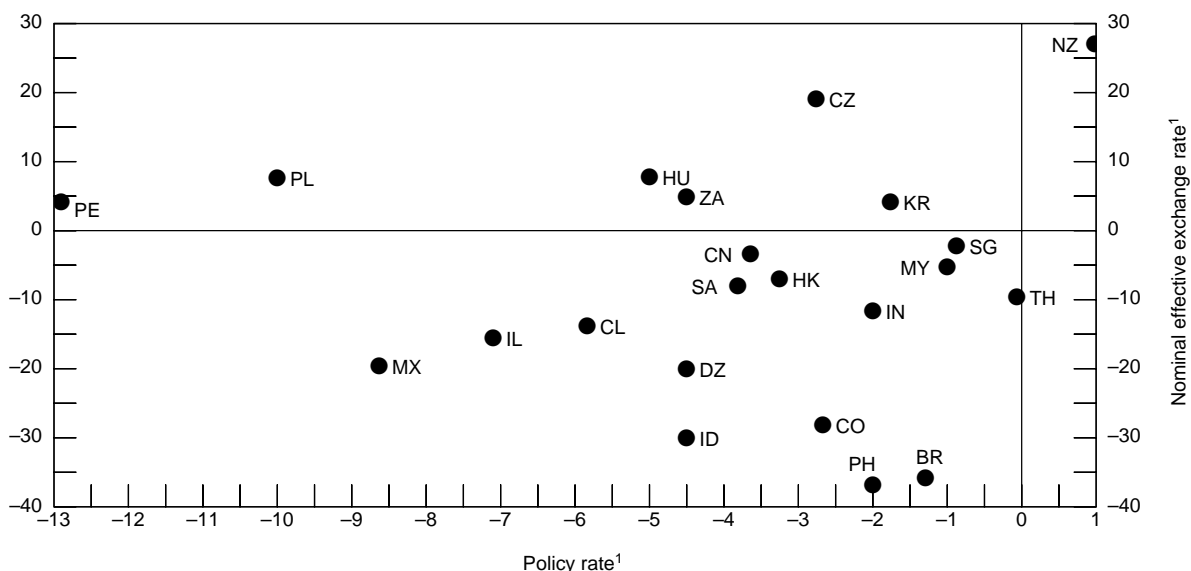
Third, domestic bond markets have grown larger and deeper in emerging market economies, further facilitating large-scale open market operations in many countries. While domestic bond markets were small during the early 1990s, they have grown in relation to GDP during the past few years. In Asia, for example, outstanding domestic government and central bank securities rose from less than 14% of GDP at the end of 2000 to 23% at the end of 2003. In Latin America and central Europe such ratios stood at 24% and 32%, respectively, at the end of 2004. This may have helped to alleviate some of the financial market imperfections which had constrained central banks' ability to sustain sterilised intervention in the past.

(a) Risk of monetary imbalance

Nevertheless, the combination of low interest rates and (in some cases) large effective depreciation of the exchange rate has meant that monetary conditions have been very expansionary in a very large number of countries in the current cycle (Graph 5). Most countries are in the third quadrant - policy rates were lowered *and* the currency depreciated in nominal effective terms.

Such a policy mix has several risks. At some point, the risk of inflation rises - even if globally inflation has been low in recent years. In China, the risk of overheating has remained a major concern during the past two years. The annual inflation rate steadily increased from a little over 1% at the end of 2003 to over 5% by the middle of 2004, before declining at the end of the year due to a sharp deceleration in food prices. Russia faced a similar situation last year as reserve accumulation to prevent appreciation of the rouble fuelled monetary growth and contributed to higher inflation in the economy. In India, a sharp increase in inflation over the past year (from 6% to 8% since July 2004) has brought a similar challenge into the picture. Many East Asian economies (Korea, Singapore and Thailand) have also recently seen upward price pressures.

Graph 5
Policy mix



¹ Cumulative changes for the period 2000-04.

Source: National data.

Second, another potential risk could arise from the large-scale issuance of debt securities by central banks. In Korea, outstanding monetary stabilisation bonds, issued primarily for sterilisation operation by the central bank, more than doubled between 2000 and 2004 to constitute 300% of reserve money (see Annex Table A3). Such ratios have increased to over 200% in the Czech Republic, 150% in Israel and 50% in Malaysia and Mexico. In China, from their introduction in April 2003 outstanding central bank securities grew to 14% of the reserve money at the end September 2004. In the current

monetary accounting convention, central bank securities are excluded from both base money and the broader monetary aggregates. As such, their monetary impacts remain hidden. Nevertheless, they represent potential liquidity in the commercial banks' balance sheets - which the banks could use for supporting future lending operations. Moreover, interest payments on such securities will continue to fuel bank reserves, adding to the challenges for central banks' monetary management. In Korea recently, for instance, interest payments on monetary stabilisation bonds are reported to have matched their net issuance.¹⁴

Third, sterilisation securities in many countries tend to be shorter-term bills rather than longer-term bonds (Table 2). For instance, a large part of central bank securities in 2004 were concentrated in maturities of less than one year. In the Czech Republic, Israel, Malaysia, Peru and Thailand, sterilisation securities are primarily less than one year while in Korea they stretch out up to two years. Only a few countries, such as Chile, issue securities which go beyond three to five years. Short-term sterilisation debts expose the central bank and the government to rollover risks. Not only do they necessitate future liquidity-draining operations, but they would also raise future costs should domestic interest rates rise.

Table 2
Maturity distribution of central bank securities¹

	Less than six months		Six months to one year		One year to three years		More than three years	
	2000	2004	2000	2004	2000	2004	2000	2004
Asia ^{2,3}	15.7	13.2	27.8	20.8	43.6	36.1	12.9	30.3
Hong Kong SAR	42.7	28.1	24.6	27.8	11.0	11.9	21.7	32.2
Korea	0.0	4.8	39.9	16.7	59.8	65.8	0.3	12.7
Philippines	0.0	0.0	0.0	5.9	52.1	0.0	47.9	94.1
Malaysia	73.5	50.5	26.5	51.6	0.0	0.0	0.0	0.0
Thailand		0.0		100.0		0.0		0.0
Latin America ^{2,4}	6.1	3.9	2.7	13.5	81.0	35.6	10.0	46.7
Brazil	0.0	0.0	1.9	0.0	89.0	15.9	9.1	84.1
Chile	22.3	13.8	11.4	1.2	4.9	26.7	61.3	58.3
Mexico	0.0	0.0	0.0	30.3	100.6	69.2	0.0	0.0
Peru	78.6	50.8	14.3	44.3	0.0	3.3	0.0	0.0
Venezuela		100.0		0.0		0.0		0.0
Central Europe ²	56.3	29.4	22.8	22.8	0.0	0.0	20.9	47.7
Czech Republic	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0
Hungary	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Poland	63.8	50.9	0.0	0.0	0.0	0.0	36.2	49.1
Israel		25.7		74.3		0.0		0.0
South Africa	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0

¹ As a percentage of total central bank securities outstanding; end of year. For 2004, data pertains to various months as reported by the central banks up to November 2004. ² Average of the economies shown. ³ Excluding Thailand. ⁴ Excluding Venezuela.

Source: National data.

¹⁴ In countries which use government bonds rather than central bank securities for sterilisation operations, large sterilisation operations create debt servicing obligations that impact government budgets. In the absence of offsetting fiscal adjustments, such payments have potential expansionary implications by raising government spending and the fiscal deficit.

(b) Risks to the financial sector

Interventions could also accentuate financial imbalances. One possible channel is that *increased bank lending* resulting from ineffective sterilisation could finance excessive investment in certain sectors such as equity and property markets. And a large overhang of excess liquidity might make banks too willing to accommodate demand for such credit. Moreover, banks which have accumulated large amounts of risk-free assets may be keen to invest in riskier assets that promise higher returns. Some have argued that reserve accumulation sends a signal that central banks have ample foreign exchange assets to support local banks should the need arise. This may, in effect, reduce the probability of future default and thus relax financing constraints on firms. The possible public provision of international liquidity may lead firms to become more relaxed in their assessment of risk and respond by increasing foreign currency borrowing to finance riskier investments even in non-tradable sectors (see Caballero and Krishnamurthy (2000)).¹⁵

Are there signs of any such risks at present? This is difficult to assess. One important trend in many countries is that banks have sharply raised their lending to households to finance consumption and housing investment. In many Asian economies mortgage and housing credit has been rising by 15 to 30% a year during the past two years (Table 3).¹⁶ In some countries such a development has been associated with strong increases in property prices. Korea has already seen a boom-and-bust credit cycle last year. Rapid growth in consumer credit in 2001 and 2002 sharply raised default rates, creating financial distress for a number of credit card companies. The economy has slowed considerably since 2003 as households reduced consumption and banks cut lending. Thailand avoided a similar situation early this year with authorities tightening lending norms for consumer and property market lending. In China, a sharp acceleration of lending to the residential and commercial housing sectors in the past two years was followed by the imposition of regulatory restrictions on bank lending. Many Latin American and central European countries have also seen faster growth in household lending in recent years.

A second possible channel is through the impact on investors' *exchange rate expectations*. Expectations of future appreciation, for instance, can attract larger capital inflows, pushing equity and bond prices too high. The economy is left more vulnerable to a subsequent reversal of inflows and a collapse of the exchange rate and other asset prices. There is at present no decisive evidence that a substantial rise in short-term inflows has created major vulnerabilities in the current cycle. There is, nevertheless, some evidence that their role may have remained significant in several recent episodes. For instance, a sharp increase in equity inflows to several Asian economies during the past two years was seen by many as investors' reaction to profit opportunities arising from expected currency appreciation. Another indicator of such expectations was the large negative long-term interest rate differential seen by many Asian economies during the periods of peak inflows and sterilised interventions (BIS (2004)). Last year India saw a rise in unhedged corporate borrowing, leading to the introduction of a regulatory requirement for firms to hedge their foreign currency exposures. The recent sharp increase in short-term inflows (and perhaps transfers) to China has been associated with the expectation of a possible future revaluation of the fixed exchange rate.

¹⁵ Caballero and Krishnamurthy (2000) show that the basic mechanism through which this happens is financial market deficiencies rather than moral hazard risk. When domestic bond markets are illiquid, issuance of sterilisation debt leads to a liquidity mismatch in the central bank's balance sheet. Since the central bank cannot redeem these securities easily and commits to supply reserves in the event of a crisis, it has, in effect, given support to domestic asset prices, effectively lowering the cost of capital for firms.

¹⁶ It is important to recognise that a relatively faster rate of increase in household credit has played a major role in recovery in domestic demand in Asia following the 1997-98 financial crisis. Such a development may also reflect stronger demand for credit led by recent liberalisation of restrictions on banks to lend to households and relatively weak credit demand from business sector. As such, not all credit expansion to households is undesirable.

Table 3
Household credit and residential property prices¹

	Mortgage credit ²			Consumer credit ²			Residential property price		
	2002	2003	2004	2002	2003	2004	2002	2003	2004
Asia ³	3.9	18.7	15.8	13.6	22.3	19.9	2.1	7.4	8.7
Hong Kong SAR	0.8	-2.1	-2.0	-2.4	-1.8	1.4	-11.8	-1.1	27.0
Indonesia	-0.6	31.6	23.3	24.2	33.6	27.6	7.6	11.0	6.2
Philippines	-0.0	-3.0		20.2	3.9		0.8	0.8	
Singapore	6.8	16.3	14.9	-0.8	17.0	2.9	-1.8	-2.0	-0.8
Thailand	11.0	16.5	14.1	20.3	19.1	19.3	7.6	18.5	16.7
Taiwan, China	4.5	10.2	13.4	1.4	19.4	20.3	-4.6	-2.3	0.4
Latin America ⁴	-14.1	-8.6	-7.3	-1.0	12.9	23.9			
Argentina	-52.3	-19.0	-15.6	-60.1	-14.1	21.7			
Brazil	-10.6	-4.8	-3.7	-6.1	5.5	16.1			
Chile	4.4	9.4	1.3	8.8	10.3	20.5			
Colombia	-10.4	-11.7	-12.8	-0.7	16.4	20.4	-13.9	8.4	4.3
Mexico	-11.4	-15.4	-11.3	28.0	34.5	39.4	-2.6	-1.5	
Peru	11.3	10.6	10.7	9.8	13.4	10.8			
Central Europe ⁴	83.6	66.3	61.8	55.4	16.4	12.1			
Czech Republic	44.7	52.7	56.3	86.9	16.5	9.5			
Hungary	129.6	82.5	68.3	18.2	16.3	15.2		15.3	10.0
Russia	78.4			28.6			22.5	18.8	
South Africa	-2.3	12.8	14.4	-1.7	7.6	7.4	17.0	19.4	25.1

¹ Annual changes, in per cent; end of year. For 2004, up to second quarter. Definitions of the series may vary across countries. ² In real terms. Deflated by consumer price inflation. ³ Average of economies shown excluding the Philippines. ⁴ Average of countries shown.

(c) Cost of intervention

An earlier presumption has been that intervention entails large running costs because emerging market countries' assets typically have higher yields than those of industrial countries. And such costs have indeed been very high in the past. In Chile, for example, the annual loss to the central bank from foreign exchange market intervention was estimated to have risen to about 0.5% of GDP during 1990 to 1993 (Velasco and Cabezas (1999)). The policy of resisting appreciation was ultimately abandoned.

During the current episode, by contrast, low domestic interest rates have reduced the carrying costs of reserves in many countries. Table 4 presents illustrative estimates of carrying costs obtained by applying the difference between the interest rate on one-year domestic treasury bonds (or central bank bills) and that for a comparable US Treasury security to annual changes in the domestic currency value of reserves.¹⁷ The table also reports, where available from central bank sources, the net revaluation effect, which is the difference between the revaluation losses or gains from foreign currency assets and that on foreign currency liabilities in the central bank portfolio.

¹⁷ It is important to recognise that estimates of sterilisation costs are very sensitive to the assumption about the interest rate.

Over the period 2000-03 as a whole, carrying costs appear to have been below 0.5% of GDP in most countries. With the domestic bond rate at or below the US Treasury rate, some countries (for instance China and Singapore) have even seen net gains rather than losses in accumulating reserves in some years. In some others (for instance Hungary and South Africa), negative carrying costs in some years reflect a decline in reserve levels rather than negative interest rate differentials. In Brazil and Turkey, given their high interest rate differentials, carrying costs have been relatively high, although they fell sharply in the latter in 2003.

Table 4
**Intervention: estimates of the carrying costs
and valuation effects of changes in reserves**

	Carrying cost ¹				Net valuation effect ²			
	2000	2001	2002	2003	2000	2001	2002	2003
Asia								
China	-0.04	-0.05	0.00	0.06				
Hong Kong SAR	0.02	0.01	0.00	0.01	-0.87	-1.03	2.18	1.88
India	0.05	0.09	0.19	0.17				
Indonesia	0.42	0.42	0.10	0.10	-0.21	0.00	-0.00	0.00
Korea	0.06	0.07	0.09	0.14				
Malaysia	0.03	-0.01	0.04	0.16				
Philippines	0.10	0.25	-0.00	0.08	0.00	0.00	0.00	0.00
Singapore	-0.16	0.03	-0.04	-0.03				
Latin America								
Brazil	-0.04	0.38	0.43	0.74	-1.06	-0.84	2.19	-0.98
Chile	-0.02	0.01	-0.00	0.00	1.73	3.11	2.80	-3.64
Mexico	0.07	0.14	0.07	0.12	-0.00	0.00	-0.01	0.00
Central Europe								
Czech Republic	-0.01	0.03	0.15	-0.01				
Hungary	0.16	-0.06	-0.19	0.07	0.58	0.37	-0.02	0.48
Poland	0.19	-0.16	0.10	0.05				
Israel	0.01	0.02	0.16	0.06	-0.78	0.02	0.19	0.50
New Zealand	-0.00	-0.00	0.01	0.03				
South Africa	0.01	0.06	0.08	-0.10				
Turkey	0.98	2.79	3.50	1.26	1.00	3.99	0.42	-0.20

¹ Calculated as the spread between the domestic and the US one-year treasury bill interest rate, applied to the change in foreign exchange reserves in domestic currency, as a percentage of GDP, in the year shown. ² Difference between the exchange rate revaluation effects on assets and liabilities of the central bank, denominated in foreign currency.

Sources: National data; BIS calculations.

The cost calculations in Table 4 do not capture own-currency capital gains or losses, which remain a major additional element of the overall return from central banks' assets. These have been much larger during the recent period. Increased prices on US dollar bonds may have boosted capital gains from foreign currency assets, adding to the return from such assets. A comparison of average returns from domestic and foreign assets brings out the importance of this factor (Mohanty and Scatigna (2005)). In Hong Kong and Israel, for instance, the negative return on domestic assets (over 12% and 51%, respectively) in 2002 was fully or partly offset by the positive return from foreign assets. In Korea and

Chile, the average return on the central bank's foreign currency assets exceeded that on domestic assets by a factor of 2 and 10 percentage points, respectively, during the same year.

4. Choice of instruments

A specific aspect of sterilised intervention in the current cycle has been the challenge for monetary authorities in finding instruments to withdraw excess liquidity. Some central banks have had too few instruments (and so introduced new measures to drain liquidity), while others have increased issuance of their own securities. Such developments raise four issues. What factors determine the choice between market and non-market instruments? What market instruments should be used? What are the implications of issuing central bank securities as against government bonds for sterilisation operations? What role have other policies played in dealing with such pressures and how effective are they?

Market vs non-market instruments

Instruments that have a high degree of marketability, such as government and central bank paper, are generally more suitable than non-market instruments because they help central banks to withdraw liquidity without adversely affecting the depth of the financial markets and without distorting the capacity of financial institutions to intermediate credit.

In the past, however, some central banks have found that the price response on market instruments in thin markets can be uncomfortably large - much larger than would be the case in deeper markets. When local bond rates rose sharply, for instance, there was greater recourse to non-market instruments for sterilisation operations. For example, during the early 1990s episode of capital inflows, many East Asian economies transferred large amounts of provident fund deposits from the banking system to the central bank at below market interest rates.¹⁸ Malaysia and the Czech Republic sharply raised reserve requirements, and Indonesia imposed a 15% tax on interest payments by banks and introduced direct credit control measures.¹⁹ The drawbacks of non-market instruments are well known. Reserve requirements effectively tax the banking system, and thus encourage financial disintermediation. Any attempt to pass on the cost to borrowers might encourage firms to borrow abroad, defeating the very purpose of sterilised intervention. The compulsory transfer of public institutions' deposits - especially when not remunerated at the market rate - forces these institutions to bear a part of the sterilisation costs.

As Table A4 in the Annex shows, during the current cycle most countries have used a number of market and non-market instruments - often in concert - for sterilising their foreign exchange market interventions. But it is striking that a preference for market instruments does seem to be becoming well established. Such a development may partly reflect the fact that interest rates remain low in most countries despite the large-scale open market operations, obviating any need for exceptional measures for exercising monetary control.

Nevertheless, there have been notable differences across countries, particularly those witnessing a large growth in foreign currency reserves. Korea has largely relied on market instruments for sterilisation.²⁰ The two large Asian economies - China and India - have used a mix of market and non-market instruments. In China, open market operations in bonds have been important. But the People's Bank of China also raised reserve requirements by 1 percentage point in September 2003 and again by 1/2 percentage point in April 2004. In addition, the fact that the central bank remunerated the excess reserves of commercial banks induced the banks to willingly hold large amounts of cash

¹⁸ See Reisen (1993) and Griffith-Jones et al (2001) for a discussion on East Asian experience.

¹⁹ See Nasution (2001) for an extensive discussion of the policy challenges confronted by Bank Indonesia in the early 1990s.

²⁰ In Korea, monetary stabilisation bonds issued by the central bank constitute the key instrument of sterilisation, although such an instrument was first introduced as a monetary policy instrument and not specifically as a sterilisation device. Such sterilisation effort was also helped by the fact that government intervened on its own account by issuing dollar-denominated liabilities, using its so-called foreign exchange stabilisation fund; see the paper by Rhee (in this volume).

balances with the central bank. These measures were supplemented by direct lending restrictions in early 2004 to contain credit growth to the overheated sectors. In India, although open market operations have been the principal instrument for sterilisation, the central bank also raised reserve requirements by 0.5 percentage points in September 2004 to control rapid growth in the money supply. The central bank has not ruled out using such an instrument solely for sterilisation purposes under exceptional circumstances.

Which market instrument?

The three major market instruments are long-term bonds, shorter-term instruments such as swaps and repos, and direct borrowing from banks at market interest rates.

Central banks may face a trade-off in issuing longer-term vs shorter-term securities. It is well recognised that long-term bonds issued to non-banks are the most effective way of draining liquidity from the banking sector - and so constraining bank lending. Hence this is particularly useful during episodes of prolonged forex inflows/intervention. And the interest rate risk is transferred to the private non-bank sector.

However, the investor base in many countries is narrow. As a result, sterilisation securities are mostly sold to banks. But by choosing to issue longer-maturity bonds central banks can reduce the rollover problem and exposure to interest rate risks associated with shorter-term bills. The consequences of higher or lower policy rates then fall squarely on the private sector - enhancing the efficacy of monetary policy. For example, in China the central bank has announced the issue of three-year securities beginning in 2005 with a view to lengthening the maturity of sterilisation bonds. To the extent that such bonds replace the shorter-term central bank bills, they could have a longer-term impact on the excess liquidity in the banking system, thereby enhancing monetary control.

On the other hand, issuing long-term bonds could prove to be expensive - especially if the yield on such bonds incorporates a significant inflation risk. Moreover, in the case of temporary forex inflows, instruments such as repurchase operations and foreign exchange swaps might be preferred. They might also increase the flexibility of monetary operations. While central banks might run up intervention-related debts during an inflow cycle, they can run them down during periods of heavy outflows and depreciation pressures on the exchange rate.

Singapore provides a good example of the use of swap and repo operations for sterilised intervention. Prior to 1998, the Monetary Authority of Singapore largely depended on foreign exchange swaps and uncollateralised deposit facilities for its liquidity operations. But with the volume of liquidity operations rising sharply and exposing the central bank to significant counterparty risk, it introduced repurchase operations on government paper. Given a highly developed swap market, the central bank uses foreign exchange swaps for longer-term withdrawal of liquidity but repurchase transactions for more short-term liquidity operations. With the economy witnessing very large capital inflows during September and October 2003, the central bank drained excess liquidity of around 8% of its liability base by using a combination of repos, swaps and deposit facilities; see Tee (2005).

A final instrument, used extensively by many countries in this cycle, is direct borrowing by the central bank from commercial banks through an overnight deposit facility.²¹ In Malaysia, direct borrowing by the central bank constitutes the single most important instrument for sterilising excess liquidity (accounting for over 69% of the monetary base). Another example of extensive use of such an instrument is Hungary.²² The speculative attack on the forint on the strong edge of the band in January 2004 resulted in very large capital inflows over a span of few days (about EUR 5 billion in two days). While intervening in the foreign exchange market the central bank absorbed most of the excess liquidity through the overnight and two-week deposit facility offered to banks. At the same time, the central bank sharply cut the interest rate on overnight deposits to reduce the profitability of speculators. The central bank in the Philippines uses its tiering deposit system (interest rates varying with the amount of the deposit) as an instrument for sterilising interventions. Similarly, the central bank

²¹ The treatment of such deposits, however, differs; some central banks have classified them as non-market instruments and some have not.

²² See the paper by Érsék in this volume.

of Mexico offers a special deposit facility to banks at market interest rates to withdraw long-term liquidity from the banking system.

Government vs central bank securities

From the perspective of the consolidated budget of the public sector, the distinction between government and central bank securities would seem unimportant - as both are official sector liabilities. Nevertheless, there may be reasons for preferring one form of issuance over another. In any event country approaches to the use of government or central bank paper for sterilisation have differed considerably. Three such approaches are discernible. First, a majority of central banks issue their own securities rather than depending on their governments to issue such paper (Annex Table A4).

A second approach followed by some central banks (for instance New Zealand, the Philippines and Singapore) has been to depend exclusively on government issuance for sterilisation operations. A recent striking example is the Reserve Bank of India, which, despite facing a shortage of securities, preferred not to issue its own securities. Under a new monetary stabilisation scheme (MSS) introduced in April 2004, the central government started issuing additional securities, over and above its borrowing requirement, exclusively for sterilisation operations.²³

A third approach has been to use both government and central bank paper. In Mexico, the market for both types of paper has grown simultaneously in the past few years. In Malaysia, the central bank has sparingly used its own securities for sterilisation operations - mostly for withdrawing longer-term liquidity - while the government issues its own bonds for financing deficits. Similar models are seen across a number of emerging market economies (eg the Czech Republic, Hungary and South Africa).

There might be several reasons for relying on central bank paper. One is that central banks in countries where governments have historically run fiscal surpluses may lack a stock of government bonds for conducting even daily monetary policy operations. Chile and Hong Kong provide two such examples. Another explanation may be that central banks that are partly or fully responsible for managing the exchange rate might prefer to issue their own securities to finance intervention.

A third reason is that governments may be unwilling to show sterilisation costs in their budgets for fear of raising the fiscal deficit and facing the prospects of substantial credit downgrades. These sterilisation costs can be large. If securities are issued in large volumes to cover intervention, the carrying cost of intervention can rise sharply as borrowing costs outstrip interest income on the foreign reserve assets accumulated in intervention. Locating those sterilisation costs in the central bank's books might also be seen to have presentational advantages.

For the central bank, however, not only would income substantially be reduced, but local currency interest rate risks could also rise. Duration mismatches increase as central banks issue shorter-term obligations to finance their longer-term foreign currency investment. Such a trend might also be reinforced by the authorities' investment policy. For example, the attempt to minimise the net running cost of holding reserves may lead the monetary authorities to increase the benchmark duration of foreign currency assets but issue more short-term local securities. Such a strategy could lengthen the average duration of foreign currency assets while reducing that of their local currency debt securities.

According to some limited (and unpublished) data available for a few central banks, the nature of the maturity mismatch problem differs across countries (Table 5). For instance, in the case of one central bank all outstanding securities were below one year, while it held about three quarters of its foreign currency assets in short-term maturities. In another case, the mismatch was the reverse. The central bank held about 70% of its foreign currency assets at less than one year to maturity by funding part of them through bonds of more than three-year maturity. It is possible, however, that duration mismatches are much higher than the data in Table 5 suggest - particularly for large reserve holders in Asia where such data are not available.

²³ One technical limitation in the Reserve Bank's case is that legislation does not permit it to issue its own liabilities. Such a legal constraint is related to the fact that under its Act, the RBI cannot borrow beyond its paid-up capital without collateral, hence permitting only repo and outright operations on government securities; see RBI (2004a).

Whether the government or the central bank should bear the financing costs of reserve accumulation is debatable. Some have argued that what matters for confidence and monetary stability is the net worth of the combined government and central bank, which depends on the consolidated balance sheet of the public sector. If governments have to issue debt or borrow from the central bank to finance the sterilisation cost, its impacts will be similar to central bank recapitalisation.

Table 5

Maturity distribution of central banks' assets and liabilities in 2004¹

	Gross foreign assets				Central bank securities			
	Less than six months	Six months to one year	One year to three years	More than three years	Less than six months	Six months to one year	One year to three years	More than three years
CB1	40.4	39.1	20.5	0.0	0.0	0.0	15.9	84.1
CB2	43.2	30.1	21.0	5.6				
CB3	53.8	10.3	25.6	10.3	50.8	44.3	3.3	0.0
CB4	54.9	20.2	24.5	0.0	0.0	100.0	0.0	0.0
CB5	35.0	36.0	21.0	8.0	0.0	0.0	0.0	100.0
CB6	84.0	2.1	2.3	11.5				
CB7	88.5	4.8	5.8	1.0	100.0	0.0	0.0	0.0

¹ As a percentage of total gross foreign assets and central bank securities, respectively. In some cases the maturity assignment given in the replies to the questionnaires did not meet entirely the maturity classification as shown in the table.

Source: National data.

Others argue that preserving the operational autonomy of central banks and the soundness of their balance sheet remains a key condition for their operational effectiveness. Such an argument, for example, is demonstrated by the intervention strategy recently announced by the Reserve Bank of New Zealand; see RBNZ (2004). The Bank has asked the government to enhance its capital base to enable it to sustain possible short-term losses from intervention.²⁴ It has argued that such a strategy will ensure its operational independence from political process and other economic objectives that may be more short-term.

Likewise, for good governance it would seem appropriate that interventions directed by the government should be borne in a transparent way by the government. Showing the costs of intervention - ultimately a claim on the taxpayer - in the budget would promote such transparency and facilitate parliamentary scrutiny. India's recent approach illustrates this point well. Under the newly introduced monetary stabilisation scheme the central government is committed to issue bonds up to a fixed amount (initially INR 600 billion but increased subsequently to INR 800 billion) and keep the proceeds as a non-interest bearing special deposit with the RBI. The entire servicing cost will appear in the government's budget. Such an arrangement ensures that the government's additional debt is fully backed by a cash deposit for redeeming these market liabilities - making clear that *net* debt has not risen. At the same time, it shifts part of the financial burden of intervention to the government in a very transparent way, subjecting such financing to parliamentary review.²⁵

²⁴ The memorandum submitted by the Reserve Bank of New Zealand to the Minister of Finance in March 2004 outlines the total financial requirement for implementing intervention. It includes NZD 1.9 billion to increase the Bank's total stock of foreign currency reserve and up to NZD 1.0 billion as additional capital base; see RBNZ (2004).

²⁵ See RBI (2004b) and Kapur (2004) for the details about the MSS scheme.

A further argument for issuance of government rather than central bank securities has a financial market angle. To the extent that local bond markets in emerging economies continue to be relatively illiquid, issuing large amounts of central bank securities could fragment the market, further reducing liquidity. Moreover, such a strategy might force market players to differentiate credit ratings of two sovereign entities, giving rise to significant distortions in their yields. Table 6, for instance, compares the monthly average yields on government and central bank securities of similar duration during January-August 2004 for three countries. Yield differences in basis points continue to be significant in some cases. Such differences might reflect several factors, such as the relative benchmark status of two types of securities, their differential tax treatments and even their different investor base. Nevertheless, such differences also imply that impacts of consolidating both issues on bond market liquidity can be substantial in some countries.

Table 6
Yields on government and central bank securities¹

	Chile		Malaysia	
	Government ²	Central bank ³	Government ⁴	Central bank ⁵
Jan 04	4.86	4.90	2.66	2.73
Feb 04	4.59	4.61	2.38	2.34
Mar 04	4.32	4.36	2.48	2.48
Apr 04	4.60	4.56	2.41	2.37
May 04	4.63	4.57	2.48	2.53
Jun 04	4.60	4.61	2.54	2.55
Jul 04	4.46	4.45	2.39	2.36
Aug 04	4.06	4.05		

¹ Monthly averages. ² Twenty-year treasury bonds. ³ Twenty-year central bank bonds. ⁴ Average of midpoints of monthly ranges of three-month and six-month treasury bills. ⁵ Average of midpoints of monthly ranges of three-month and six-month central bank bills.

One suggestion has been that the central bank and government might issue securities of different maturities, reducing the problem of multiple yield curves. Korea has adopted such a strategy. The Bank of Korea's monetary stabilisation bond commonly stretches out to three years whereas the government has issued primarily long term securities. Another suggestion proposed by McCauley (2003) is that the government might supply the required securities to the central bank by overfunding its fiscal operations and depositing the cash with the central bank. This is in effect the approach taken in India, albeit for somewhat different reasons.

Capital account measures

Another response to upward pressure on the currency has been to relax capital account restrictions.²⁶ During the early 1990s capital inflows episode, many Latin American and Asian countries (notably Mexico, Brazil, Malaysia, Chile and Korea) eased restrictions on capital outflows. In the current cycle, the authorities in China have announced several measures to encourage outflows. These have included: relaxing residents' overseas travel restrictions; promoting a qualified domestic investor scheme for encouraging outward portfolio investment; allowing domestic firms to issue foreign currency denominated bonds in the local market; and increasing the limit on firms' direct investment

²⁶ There is, nevertheless, some evidence to show that liberalising capital outflows may not succeed in reducing net inflows, especially if such liberalisation boosts the confidence of international investors, leading to more inflows; see Labán and Larraín (1994).

abroad. India has announced a comprehensive set of measures that aim to promote outward portfolio investment by residents, and encourage companies to prepay their external debt. Many countries (eg India and Thailand) have reduced their official sector debt by prepaying loans to international creditors.

In some cases, such outflow liberalisation has gone hand in hand with continuing or even new restrictions on inflows. Last year the authorities in Thailand restricted non-resident baht deposits in the banking system to counter appreciation pressures. Limitations were also placed on domestic financial institutions' capacity to lend to non-residents. In others, such restrictions apply to non-resident investment in the domestic bond market either prohibiting certain types of investors (eg India) or placing a minimum holding period for their investments (eg Colombia and Poland).

Whether such restrictions provide effective protection against speculative inflows remains an open question. The recent growth of non-deliverable forward markets in many Asian currencies is one demonstration of how such controls can be evaded. The paper by Rhee for this meeting shows the challenges faced by the Korean authorities from the offshore NDF markets on the won. A sharp rise in NDF transactions between the onshore banks and non-residents during the past four years has exaggerated won/dollar exchange rate volatility - non-residents buying (selling) dollars results in dollar short (long) positions of onshore banks in the spot market causing the won to depreciate (appreciate). To prevent such volatility the authorities in Korea imposed restrictions on the onshore entities' lending and borrowing activities with offshore participants in the NDF market in January 2004. With the exchange rate stabilising the restrictions have been partly reversed in recent months. Moreover, as the experience of Singapore demonstrates, such restrictions are not without costs - they tend to reduce the depth of domestic financial markets; in particular, they may prevent the authorities' attempts to develop a domestic bond market. For these reasons, the Monetary Authority of Singapore has recently substantially eased such restrictions.

5. Conclusion

The recent episode of prolonged, substantial intervention is not yet over. It is unclear how far the levels of foreign exchange reserves now held by some monetary authorities represent a quasi-permanent shift in desired holdings. If not, then at some point in the future such monetary authorities will presumably seek to intervene in the opposite direction. But by how much and how fast cannot be predicted. Nor can the consequences of such a reversal be foreseen. But it does seem unlikely that the circumstances prevailing over the past five years, which have been so favourable to intervention - notably low inflation and financial markets' acquiescence in large current account imbalances - will last for ever. The policy dilemmas associated with conventional wisdom would then resurface.

Annex

Table A1
Capital flows and intervention¹

	Net capital flows			Current account balance			Change in reserves		
	1990-93	1995-96	2000-04 ³	1990-93	1995-96	2000-04 ³	1990-93	1995-96	2000-04 ³
Asia, large ²	46	119	350	28	-18	354	18	47	649
China	35	79	234	20	9	189	-7	5	398
India	20	16	63	-18	-12	8	9	3	69
Korea	20	41	37	-14	-32	58	5	32	71
Taiwan	-29	-17	16	39	17	99	11	7	111
Asia, other ²	81	70	-206	-32	-40	285	75	16	88
Hong Kong SAR			-55	26	-8	46	18	-3	7
Indonesia	22	21	-17	-12	-14	32	4	6	8
Malaysia			-16	-10	-13	48	17	5	26
Philippines	11	17	-15	-8	-6	18	4	2	-1
Singapore	7	-9	-77		29	106	21	4	37
Thailand	41	41	-26	-28	-28	35	11	3	11
Latin America ²	128	100	77	-86	-64	-67	57	-10	44
Argentina	22	17	-52	-10	-12	6	9	2	2
Brazil	3	63	46	1	-41	-42	23	-8	14
Chile	7	8	2	-4	-4	-2	4	-2	1
Colombia		7	7		-5	-4	3	-1	2
Mexico	94	3	94	-70	-4	-64	15	3	17
Peru	1	8	7	-7	-8	-5	2	-1	2
Venezuela		-5	-26	4	11	44	0	-2	7
Eastern Europe ²	-3	23	85	-6	-13	-74	9	11	24
Czech Republic	3	12	29	0	-6	-20		3	12
Hungary	7	5	23	-3	-3	-26	6	1	2
Poland	-14		33	-3	-4	-28	-0	8	10
Algeria	-2			4			1	-1	25
Israel	2	9	-3	-4	-10	-5	0	2	3
New Zealand	6	8	11	-4	-7	-13	-1	-0	1
Russia		-26	-45		0	0		-5	59
Saudi Arabia	57	12	-59	-67	-5	65		-1	8
South Africa	-3	7	13	8	-4	-5	0	-1	5
Turkey	14	10	15	-10	-5	-27	0	1	16

¹ In billions of US dollars. ² Sum of the countries shown. ³ Up to September 2004.

Sources: IMF.

Table A2

Foreign reserves net of currency in circulation

	As a % of M1		As a % of M2		As a % of domestic credit to the private sector	
	1990	2004	1990	2004	1990	2004
Asia, large	-1.9	99.7	-3.5	11.2	-4.3	16.8
China	-26.0	20.2	-12.4	7.7	-11.2	10.2
India	-47.5	40.4	-16.7	11.4	-28.2	22.2
Korea	23.9	324.0	2.6	21.0	3.7	27.3
Taiwan	41.8	14.2	12.6	4.5	18.7	7.3
Asia, other	96.1	192.8	17.6	34.9	20.8	48.5
Hong Kong SAR		213.5	7.1	18.7	9.0	38.2
Indonesia	37.2	99.2	10.4	24.0	9.0	47.2
Malaysia	62.3	167.7	18.9	38.5	19.1	41.3
Philippines	-4.6	140.3	-1.2	27.8	-2.1	50.7
Singapore	271.4	386.8	55.8	78.9	74.2	87.2
Thailand	114.2	149.1	14.6	21.3	15.8	26.1
Latin America	116.7	116.9	42.3	40.2	61.1	68.6
Argentina	60.5	54.4	23.4	20.5	17.3	60.5
Brazil	34.7	104.2	11.2	25.0	8.9	23.7
Chile	276.8	177.0	83.1	39.5	46.5	25.5
Colombia	89.5	96.5	48.8	31.4	60.4	44.1
Mexico	13.4	71.4	2.1	12.3	4.9	39.6
Peru	91.5	154.2	49.2	53.7	147.7	77.9
Venezuela	250.5	160.3	78.5	99.2	142.1	208.9
Central Europe		48.1		21.2		34.0
Czech Republic		44.4		25.1		52.4
Hungary	-13.4	38.7		14.4	-7.1	14.8
Poland	8.3	61.3		24.2	6.6	34.9
Algeria	-46.2	92.5	-36.4	51.0	-50.5	287.2
Israel	144.1	213.4	13.6	19.3	16.6	20.7
New Zealand	70.9	32.9	10.6	5.4	10.7	4.1
Russia		62.4		32.4		42.7
Saudi Arabia	164.2	93.7	89.2	50.6	256.4	80.9
South Africa	-1.8	11.1	-0.7	5.8	-0.6	4.2
Turkey	42.7	165.6	13.8	24.4	21.1	54.4

Sources: IMF; national data.

Table A3
Central bank securities outstanding¹

	2000	2001	2002	2003	2004 ²
Asia ³	77.4	83.8	79.0	92.1	102.2
Hong Kong SAR	50.4	49.5	47.7	41.1	43.2
Indonesia	0.0	0.0	0.0	0.0	0.0
Korea	235.1	241.0	221.9	258.9	297.7
Malaysia	20.5	73.7	89.6	86.7	50.1
Philippines	21.1	26.1	23.4	20.6	24.3
Thailand	0.0	0.0	0.0	19.1	24.5
Latin America ³	78.8	93.0	38.0	29.9	26.0
Brazil	128.1	158.5	34.3	16.4	8.6
Chile	0.6	0.6	0.6	0.6	0.5
Mexico	60.6	61.7	62.4	47.6	49.9
Peru	6.0	7.4	6.0	16.5	24.0
Venezuela	0.0	0.0	14.5	70.7	52.5
Central Europe ³	62.6	51.0	81.0	69.7	68.4
Czech Republic	61.0	77.6	269.1	250.8	241.5
Hungary	30.9	33.4	2.0	1.9	1.9
Poland	73.8	46.3	33.2	20.8	22.3
Others ³	3.6	25.4	33.6	36.4	52.2
Israel	0.0	96.0	110.9	130.9	179.3
South Africa	4.8	1.7	7.6	4.6	9.5

¹ As a percentage of reserve money; end of period. ² Data pertains to various months as reported by the central banks up to November 2004. ³ Weighted average of the economies listed based on 2000 GDP and PPP exchange rates.

Sources: IMF; central banks.

Table A4

Main instruments for sterilisation

	Monetary instruments		Fiscal policy	
	Market	Non-market	Fiscal stance	Government cash balances
Hong Kong SAR	No sterilisation	No sterilisation	No	Yes; (operations via commercial banks)
India	TBs and government securities, liquidity adjustment facility auctions, and since April 2004 monetary stabilisation scheme: occasionally govt surplus balance	Reserves ratio under extreme conditions		Yes, (during 2003-04)
Indonesia		Reserve requirements (not explicitly used for sterilisation)		
Korea	Monetary Stabilisation Bonds	No	No	
Malaysia	Mainly money market borrowing; CB's own securities	Centralisation of government deposits; statutory reserves to a small extent	No	Yes (coordination between CB and banks on a daily basis)
Philippines	Repos, reverse repos and outright transactions in general	Tiering structure of over night deposits with the CB	No	Yes (coordination with the government on an infrequent basis)
Thailand	Repos, FX swaps, CB securities	No	No	Yes (coordination with the government on an daily basis)
Brazil	Reverse repos (government bonds as collateral)	No	No	
Chile	CB's own securities	No	No	Yes (monthly coordination between govt and the CB)
Colombia	Government bonds	No	No	Yes (coordination with the government)
Mexico	CB's own securities (government bonds used in the past); long-term deposits with CB	Yes; special deposit facility (at market rates) irregularly used	No	No
Peru	CB's own securities	No	No	No
Czech Republic	Repos; CB bills used as collateral	Reserve requirements (not specific to sterilisation)	No	Yes (generally taken into account for monetary policy operations)

Table A4 (cont)

Main instruments for sterilisation

	Monetary instruments		Fiscal policy	
	Market	Non-market	Fiscal stance	Government cash balances
Hungary	Two-week and overnight deposit facilities			Yes (cooperation at the strategic level)
Poland	CB securities (14 days maturity); deposit facility			Yes (very limited coordination with the government)
Israel	One-year TBs ("Makam" government securities only issued for monetary policy purposes)	Yes	No	No
New Zealand	TBs, government bond sales; repo and reverse repo of government securities	No		
South Africa	CB securities; government bonds (outright & repos)	No; but currently considered	No	Yes (government cash flows managed to have a neutral liquidity impact)
Turkey	Mainly reverse repos in government bonds; standing deposit facilities and deposit auctions	No		Yes (but still limited coordination)

Source: Central bank responses to BIS questionnaire.

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Survey of central banks' views on effects of intervention

Dubravko Mihaljek¹

Introduction

This paper addresses two main issues. First, how do central banks in the emerging market economies assess the effects of their foreign exchange interventions on the exchange rate? Second, how do they view other external effects of intervention, such as the relationship between intervention, reserve accumulation and external vulnerabilities, and the usefulness of additional rules on foreign exchange transactions? The analysis in the paper is based on central bank responses to a BIS questionnaire prepared for this meeting, interviews with central bank staff, and studies of intervention prepared by central banks from emerging market economies.

To date, there have been only a few empirical studies of foreign exchange intervention covering a broad cross section of emerging market economies. The most extensive study is Canales-Kriljenko (2003), based on the IMF's 2001 Survey on Foreign Exchange Market Organisation. One of the main hypotheses advanced in this paper is that central banks in many emerging markets may be able to conduct foreign exchange intervention more effectively than the central banks of countries issuing the major international currencies. This hypothesis is supported by evidence indicating the large size of intervention by emerging economy central banks relative to their foreign exchange market turnover. Moreover, evidence is presented that central banks in emerging markets issue a large volume of regulations and conduct their foreign exchange operations in a way that increases the central bank's information advantage over private sector participants. However, the study does not demonstrate decisively that official intervention in the emerging market economies is indeed more effective because of these characteristics of their foreign exchange markets.

Another useful empirical study is by Neely (2001), who examined the practice of foreign exchange intervention in a sample of 22 countries, of which nine are emerging market economies.² This study addressed directly to central banks several questions on the effectiveness of foreign exchange intervention. It will therefore be used to compare some responses to the BIS questionnaire.

Central banks from the emerging market economies have conducted a number of own studies on the effectiveness of intervention. The recently published studies, many of which are surveyed in the accompanying review of the efficacy of foreign exchange intervention, include Tapia and Tokman (2004) for Chile; Holub (2004) for the Czech Republic; Pattanaik and Sahoo (2003) for India; Ryoo (2003) for Korea; Flores Bahamonde (2003) and Azañero Saona (2003) for Peru; Abenoja (2003) and Boge et al (2001) for the Philippines; Guimarães and Karacadağ (2004) for Mexico and Turkey; and Domaç and Mendoza (2004) for Turkey. In addition, the central banks of China, Colombia, Indonesia, Malaysia, Mexico, Peru and Turkey have conducted internal studies on the effectiveness of official intervention.³

The rest of this paper is divided into two parts. Section 2 analyses central banks' own views on the effectiveness of intervention, looking at the frequency and size of interventions, effectiveness by goals and channels of influence, central banks' information advantage in foreign exchange markets, and secret interventions. Section 3 considers other external effects of intervention: the relationship between reserve accumulation, credit ratings and external vulnerabilities; the use of capital controls

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² These are: Brazil, Chile, the Czech Republic, Hong Kong SAR, Indonesia, Mexico, Poland, Korea and Taiwan (China).

³ A study on Iceland by Isberg and Pétursson (2003) is useful for comparison with the recent experience of a small industrial country.

and rules on foreign exchange transactions in conjunction with official intervention; and the impact of financial dollarisation on the effectiveness of intervention.

1. Central banks' views on effectiveness of intervention

Frequency and size of interventions

Of the 19 central banks that responded to the BIS questionnaire, about one third have intervened regularly (ie on more than 50% of business days), one third relatively infrequently (every 10 days or less), and one third have not conducted any interventions at all over the past three years (Table 1). At first sight, this pattern of responses would seem to imply a bias *against* interventions in the emerging market economies, contrary to the claims in much of the literature. However, four central banks reported that they intervened on every business day; in addition, all of the three central banks that did not respond to this question are known to intervene, two of them frequently. Data in Table 1 also indicate that the frequency of interventions has declined marginally since 2002.

Table 1
Frequency of interventions

Percentage of business days on which central banks conducted foreign exchange intervention	Number of central banks which conducted foreign exchange intervention		
	2002	2003	2004
Regularly (>50% of business days)	5	6	6
11-50% of business days	4	3	2
0-10% of business days	5	5	5
Never	5	5	6
No response	4	4	4
Total number of observations	23	23	23

Source: Central bank responses to the BIS questionnaire.

All of the central banks in the sample that do not intervene have adopted inflation targeting frameworks and floating exchange rate regimes. It is interesting that one central bank that operates a fixed exchange rate regime intervenes seldom, relying most of the time on interest rates and other instruments affecting interbank liquidity, while one that operates what is nominally a floating exchange rate regime intervenes regularly. Countries in the sample where central banks do not intervene (as well as those that seldom intervene) are generally small open economies, while those that intervene regularly are much larger and, with one exception, are equally open.⁴

Data in Table 2 indicate that, in the sample of economies studied in this paper, central bank interventions are small relative to the size of their foreign exchange markets. The average size of interventions declined from 12% of average daily turnover in 2002 to 5% in 2004, or about USD 50 million in absolute terms. The most frequent daily intervention volume (the mode) has declined by almost 50% over the past three years, and at USD 29 million in 2004 was fairly small. The largest daily intervention volume in the sample amounted to USD 5 billion or 780% of the average daily turnover in that country's foreign exchange market, boosting official reserves by 38%. The smallest interventions amounted to just USD 0.5 million. In sum, relative to the size of foreign reserves, the size of interventions (with the exception of the largest one) has been negligible.

⁴ Openness is here measured as the share of exports and imports of goods and services in GDP.

Against this background, it is interesting to note the evidence from Canales-Kriljenko (2003), who used a sample of 17 out of 90 central banks surveyed to argue that central banks had a dominant position in developing countries' foreign exchange markets. Moreover, he obtained high market shares for central bank intervention measured only against trading in the interbank market. In many developing countries, interbank trading accounts for just a fraction of turnover in the bank-customer segment of the market.⁵ At the level of bank-customer trading, Canales-Kriljenko (2003) finds lower shares of central bank intervention in total trading volumes, although these shares are still high compared to the ones reported in Table 2. This suggests perhaps that the countries reporting these data to Canales-Kriljenko were less developed than the ones studied in this paper.

Table 2
Size of interventions

Size of foreign exchange interventions	In millions of USD			As a percentage of average daily FX market turnover			As a percentage of average monthly FX reserves		
	2002	2003	2004	2002	2003	2004	2002	2003	2004
Average	42	54	50	12	8	5	0.45	0.28	0.14
Mode	52	41	29	3.6	7.1	0.7	0.14	0.22	0.06
Maximum	450	4,936	465	71	780	52	1.7	38.3	3.7
Minimum	1.0	0.5	0.5	0.12	0.02	0.03	0.010	0.010	0.004

Number of observations: 13 out of 23. Three central banks in the sample did not intervene during 2002-2004 Q3.

Source: Central bank responses to the BIS questionnaire.

It is also instructive to juxtapose the size of interventions to the development of foreign exchange markets. Data from the latest *BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity* (BIS (2005)) indicate that average daily turnover of most emerging market currencies has increased strongly since 1998 (Table A1 in Appendix). The share traded in the derivatives market (forwards and swaps) relative to the spot market has also increased in many countries, as has the share of trading activity undertaken outside the home market. Yet compared to currencies of smaller industrial countries, the turnover in emerging market currencies remains miniscule. Table A1 shows, for instance, that the average daily turnover of most actively traded emerging market currencies – the Hong Kong dollar, the Korean won and the Mexican peso - represents only a fraction of the turnover in the Australian dollar, the Swedish krona or the Swiss franc markets. The small size of interventions relative to average daily turnover noted above is therefore not a result of increased turnover in foreign exchange markets but of small size of interventions.

The second point to note in this context is that central banks in emerging markets have indeed an overwhelming potential "firepower". The ratio of official reserves to average daily turnover is vastly higher in emerging markets than in industrial countries - on average, official reserves were 15 times the size of daily turnover in emerging market currencies, compared with less than half in smaller industrial countries. It is therefore not surprising that the threat of intervention - and hence its potential effectiveness - is much greater in emerging markets than industrial countries.

The sample size is clearly far too small to draw firm conclusions about the relationship between the size of intervention and different monetary and exchange rate regimes. Only two economies operating under a fixed exchange rate regime reported data for Table 2. One of them did report higher mean and mode sizes of intervention than central banks operating under managed or floating regimes. Interventions by managed floaters were also larger on average than those by free floaters.

⁵ Interbank trading accounts for most of the foreign exchange market turnover among the major international currencies.

What is the evidence on the impact of size and frequency of interventions on their effectiveness? As discussed in Archer's paper in this volume on the techniques and tactics of intervention, Japan, for instance, has in recent years shifted from regular and small foreign exchange interventions to large and less frequent interventions. Some argue that this has made Japanese interventions more effective than before - but at the price of a truly massive scale (7% of GDP in FY 2003).

From the small sample at hand, it is difficult to draw conclusions about this issue for the emerging market economies. Out of 18 central banks, 14 characterised their interventions as effective most of the time (Table 3). Eight of these 14 central banks also reported the size and frequency of their interventions. Most of these central banks intervened less frequently on average (ie on less than 10% of business days, with three exceptions), and in relatively small amounts (3% of market turnover on average).

Five central banks that viewed their interventions as "sometimes effective" intervened in large amounts (6-22% of average daily turnover) on a small number of occasions, though one of them was present in the market on 30% of business days in one particular year. The sixth central bank that viewed its intervention as sometimes effective intervened every business day in small amounts (of about 0.6% of average daily turnover). The seventh last intervened in 2002, in small amounts, on about 10% of business days.

In sum, survey results seem to indicate that the emerging market central banks that intervene *less* frequently in *smaller* amounts tend to view their interventions as more effective on average than those that intervene less frequently in *large* amounts. The interpretation of this finding is not straightforward because of the simultaneity problem - those central banks with large interventions may have faced the greatest pressure. Finally, one should note that many central banks that operate under a floating exchange rate regime intervene only to address exceptional circumstances, rather than to affect the exchange rate per se. The size and frequency of their interventions are therefore determined on a case by case basis.

Table 3

Effectiveness of interventions by major goals

	Correct misalignment or stabilise exchange rate at desired level or rate of change	Calm disorderly markets (excessive exchange rate volatility)
Effective most of the time	Argentina, Chile, Hong Kong SAR, Malaysia, Singapore, Thailand	Argentina, Chile, Colombia, Hungary, India, Indonesia, Korea, Peru, Philippines, Singapore, Thailand, Turkey
Sometimes effective	Czech Republic, Hungary, Indonesia, Korea, Venezuela	Brazil, Czech Republic, Mexico, Venezuela
Never (or rarely) effective		

Number of observations: 18 out of 23. Three central banks in the sample did not intervene during 2002-2004 Q3.

Source: Central bank responses to the BIS questionnaire.

Assessments of effectiveness by goals of intervention

Regarding the effectiveness of interventions in meeting different objectives, 12 out of 16 central banks that intervened to calm disorderly markets viewed their intervention as mostly effective, while four viewed it as sometimes effective (Table 3, last column). In contrast, only half of the central banks that intervened to correct misalignment or to stabilise the exchange rate at a desired level (or rate of change) indicated that this type of intervention was effective most of the time. Among those that viewed this type of intervention as effective, two out of six (Hong Kong SAR and Malaysia) operate - not surprisingly - a fixed exchange rate regime.

Regarding intervention to calm disorderly markets, several central banks felt that their intervention was effective primarily because it helped relieve liquidity shortages that accompanied episodes of

excessive exchange rate volatility due to shallow foreign exchange markets. One central bank managed on one occasion to calm the market with a sale of as little as USD 9 million (compared to its reserves of USD 33 billion) at a time when concerns about liquidity were beginning to emerge.⁶

Views differed on whether intervention to calm disorderly markets is more effective in influencing the exchange rate at shorter time horizons than at longer horizons. Several studies in the context of industrial countries have found evidence that foreign exchange intervention might be more effective in influencing the exchange rate at shorter time horizons (eg over two to three days or over one week) than at longer horizons (eg moving the path of the exchange rate over three months or longer).⁷ Neely (2001) found, in a sample of 13 industrial countries and nine emerging economies, that in 39% of cases it took just a few minutes to observe the effect of intervention on exchange rates; in 22% of cases it took a few hours; and in 49% a few days or more.

The majority of central banks in this survey confirmed that the short-term effects of intervention were larger, partly because continuous intervention to attain long-term effects was costly. However, one central bank noted that repeated intervention was necessary at times of heightened volatility because the effects of an initial intervention were not lasting.

Several central banks commented that the main burden in stabilising the exchange rate was always on monetary policy - and often on fiscal policy as well. For instance, if the exchange rate was depreciating because of weak fundamentals, intervention would not help stabilise it for very long unless the central bank raised interest rates. Likewise, trying to reverse depreciation by intervening in the forex market was ineffective in the face of large budget deficits.

Due to relatively favourable conditions in global capital markets over the past three years, most central banks in the sample intervened to correct misalignment or stabilise the exchange rate during periods of appreciating exchange rates. Currency appreciation was easier to resist than depreciation, but even here market scepticism could be an obstacle. For instance, if a central bank had already accumulated large official reserves, markets knew in some cases that the central bank would be reluctant to acquire additional reserves because of the negative impact of sterilisation on its balance sheet. Although they did not feel constrained by the size of their foreign currency reserves, most central banks judged this type of intervention as only partly successful in stemming appreciation.

Three central banks (of which one adopted a fixed exchange rate regime) found no difference in intervention effectiveness between periods of appreciation and depreciation.

Assessments by channels of influence of intervention

The recent academic literature surveyed in the accompanying paper by Disyatat and Galati in this volume suggests that interventions in industrial countries are more likely to influence the exchange rate through the expectations channel than through the portfolio balance channel. For the expectations channel to work, however, interventions would need to signal future monetary policy. On the other hand, in the emerging market economies the portfolio balance channel should also be effective, given that the official reserves, as noted above, are much larger relative to the local foreign exchange market, and debt instruments denominated in domestic and foreign currencies are less substitutable than in industrial countries.

The survey results provide qualified support for this view. Most notable is the consensus view that interventions which create expectations about future intervention are effective (Table 4, penultimate column). Consistent with the recent literature, seven central banks consider as partly or mostly effective those interventions that change private agents' exchange rate expectations by giving signals about the future stance of monetary policy. But 10 central banks also view the portfolio balance channel as partly or mostly effective.⁸ In addition, some central banks reported other channels of

⁶ Experience from some industrial countries indicates that, when markets are under pressure and bid-offer spreads start to widen, the mere offer by the central bank to sell foreign exchange at the prevailing bid rate might be sufficient to calm the market, without any transactions actually taking place at that rate.

⁷ See, for instance, Dominguez and Frankel (1993) and Truman (2002, 2003).

⁸ The monetary policy channel is examined in the paper by Mohanty and Turner in this volume.

influence as being of relevance; for instance, the microstructure channel (which was probably effective in the Czech Republic during July-September 2002; see Holub (2004)); the liquidity effect in the foreign exchange market; and signalling the central bank's view about the rate of change of the exchange rate. Some central banks felt that intervention operated through all the channels identified in Table 4 because they intervened for different reasons at different times.

Central banks put forward some interesting arguments supporting these assessments. On the portfolio balance channel, one central bank noted that it was able to influence the exchange rate to a certain extent because it was a major player in both foreign exchange and securities markets. Two other central banks considered this type of intervention as effective only on those specific occasions when movements in foreign and domestic currency assets were anticipated, and were considered to be of a one-off nature (eg asset reallocations associated with large privatisation inflows). However, when such inflows were expected to continue, central bank intervention tended to have only a short-lived effect on asset allocations and hence the exchange rate.

Some central banks have found the expectations about future intervention an effective way to influence market behaviour. One central bank considered this channel to be the most effective means to dissipate appreciation or depreciation pressures in the short run. Two others noted that, once they started to intervene, market participants in general expected interventions to continue, and tried to establish a pattern for interventions. Still another central bank argued that intervention provided an indication of the views of the monetary authorities as to whether the exchange rate was in line with fundamentals. Since this central bank was considered to be a credible institution, an intervention was generally seen as a signal of continued intervention in the future to prevent the exchange rate from deviating too much from macroeconomic fundamentals. This, in turn, influenced the exchange rate in the desired direction.

Table 4

Channels of influence of intervention on exchange rate

	Monetary policy channel ¹	Portfolio balance channel ²	Expectations channel		Other channels ⁴
			Expectations about future stance of monetary policy ³	Expectations about future intervention	
Effective most of the time	Brazil, Czech Republic, Hong Kong SAR	Argentina, Brazil, Philippines, Turkey	Argentina, Brazil, Czech Republic, Hungary, Philippines, Singapore	Argentina, Brazil, Hungary, India, Indonesia, Peru, Philippines, Turkey	Czech Republic
Sometimes effective	Argentina, Colombia, Hungary, Indonesia, Korea, Turkey, Venezuela	Czech Republic, Hungary, Korea, Peru	Indonesia, Korea, Thailand	Colombia, Czech Republic, Korea, Thailand, Venezuela	Korea, Mexico
Never (or rarely) effective	Philippines	Singapore			

Number of observations: 15 out of 23. Three central banks in the sample did not intervene during 2002-2004 Q3.

¹ Effect on domestic interest rates, when intervention is not fully sterilised. ² Composition of domestic and foreign assets held by the main market participants changes as a result of sterilised intervention. ³ Sterilised intervention changes private agents' exchange rate expectations by giving signals about the future stance of monetary policy. ⁴ For example, microstructure channel - impact of intervention on buy or sell orders of traders who follow past market trends.

Source: Central bank responses to the BIS questionnaire.

Interventions that influence the exchange rate by affecting expectations about the future stance of monetary policy are seen to operate mainly through the differentials between domestic and foreign

market rates. Several central banks observed that the narrowing and widening of these differentials has led to shifts in expectations about future movements in relative money supplies, which could steer the exchange rate in the desired direction. One central bank observed, however, that interventions affected the relevant domestic interest rate with a lag.

According to one central bank, intervention affected the exchange rate through the expectations channel because of the role the exchange rate plays in the dynamics of domestic inflation. When the pass-through from exchange rate changes to inflation was high, changes in exchange rates were transmitted through the economy faster than changes in interest rates, so there was room for intervention to support monetary policy. However, this effect seemed to work only if central banks openly said that they intervened to support the disinflation process; otherwise they could confuse the market.

Central banks' information advantage

One condition for the expectations channel to function is that the central bank taking action either has or is believed to have an information advantage over market participants. Sterilised interventions can then affect market expectations of the exchange rate by "signalling" future monetary policy. A central bank can, for instance, signal a more restrictive future monetary policy by purchasing domestic currency.

Against this background, central banks were asked to what extent they had an information advantage relative to the large number of uncoordinated, competing individual participants in the more "atomistic" structure of the foreign exchange market. They were also asked what impact this advantage had on the effectiveness of their intervention. Most central banks (15 out of 21) responded that they had "considerable" or "some" information advantage; three felt they worked with basically the same information set as market participants, while three thought they were at a disadvantage compared with market participants (Table 5). One central bank remarked that any information advantage it might have had in the past had disappeared with the spread of the internet.

Table 5

Central bank's information advantage and its impact

Extent of central bank's information advantage in the foreign exchange market ¹			
Considerable information advantage	Some information advantage	Equal information as other market participants	Information disadvantage relative to other market participants
Brazil, Hungary, Korea, Malaysia, Peru, South Africa, Turkey	Argentina, Colombia, India, Mexico, Philippines, Poland, Singapore, Thailand	Chile, Czech Republic, Hong Kong SAR	Indonesia, New Zealand, Poland
Impact of information advantage on effectiveness of intervention ²			
Major positive impact	Some positive impact	No impact on effectiveness of intervention	
Brazil, Korea, Philippines, Singapore, Turkey	Argentina, Hungary, India, Peru, South Africa, Thailand	Colombia, Malaysia, Mexico	

¹ A total of 21 central banks (out of 23) responded. ² A total of 15 central banks (out of 23) responded (three central banks do not intervene).

Source: Central bank responses to the BIS questionnaire.

Examples of the information advantage that central banks enjoy relative to other market participants include: receiving on a daily basis positions and transactions similar to the BIS triennial foreign exchange survey, including access to data on all spot transactions, aggregated and disaggregated

data on foreign exchange swap positions and turnover (albeit with a lag in some cases), and on forward transactions (including non-deliverable forwards); detailed statistical data on transactions of all banks, brokerage companies and other participants in foreign exchange markets; and information on the movement of government funds and large inflows and outflows of funds in the system due to debt servicing, foreign portfolio investment and trade flows. In addition, in their role as regulators of commercial banks, central banks in many countries can request information regarding flows they see in the foreign exchange market. Most central banks also felt they had very good market intelligence networks and received ongoing feedback from market participants. As one central banker put it: "We can observe every aspect of market participants' behaviour - except their intentions."

With one exception (Hong Kong SAR), central banks that felt they had an information *disadvantage* relative to other market participants were those that did not intervene. One of them noted that it had no access to the trading quotations (either transaction prices or volumes) and no precise information about corporate flows and portfolio flows in general, given that it was not an active market participant.

The extent of information advantage generally corresponds to central banks' assessments of the impact this advantage has on the effectiveness of intervention. For instance, central banks that have considerable or some information advantage also find that this advantage has a major or some positive impact on the effectiveness of their intervention. But in Colombia, Malaysia and Mexico, this advantage apparently had no impact on the effectiveness of intervention. In the case of Colombia, the reason was that the option holders decided when to exercise the options the central bank used for intervention purposes.

Secret interventions

A major puzzle in the literature on the effectiveness of intervention is why most actual intervention operations in the foreign exchange market have been - and still are - largely secret. That is, they are not publicly announced by monetary authorities, despite the relatively robust finding that policy announcements affect expectations through the signalling channel. Central banks were asked which of the four types of arguments in favour of the secrecy that have been identified in the literature most closely corresponded to their practice.⁹

There is a significant range of views in the survey about the purpose of secrecy (Table 6). Ten central banks conducted secret interventions. Six of them reported that secret interventions helped them maximise market impact and were always or sometimes effective, ie helped them calm a highly volatile market. Two central banks considered that interventions conducted to minimise market impact were always effective. One cited portfolio adjustment as a reason for secret intervention, and two cited other reasons (for instance, the desire to prevent the expectation that the exchange rate could move in only one direction).¹⁰

In addition to the 10 central banks that conducted secret interventions and three that never intervene, seven other central banks, of which five are from Latin America, stated that they did not practise secret interventions (although one of them has the authority to do so). Only three central banks out of a total of 23 provided no response to this question.

As noted in Moser-Boehm's paper in this volume, most central banks believe that secret interventions are not against the principle of transparency if followed up by ex post reporting. Several noted that secret interventions could be useful as part of tactics - some ambiguity with respect to actions of the central bank on a daily basis could help the central bank (see the paper by Archer in this volume).

⁹ See Sarno and Taylor (2001). The four arguments are: (i) those based on the central bank's desire to minimise the effects of an unwanted intervention - for instance, because the decision to intervene has been taken outside the central bank (eg by the treasury); (ii) those based on the central bank's desire to maximise the impact of intervention by calming a highly volatile market (an announcement of intervention might exacerbate the perceived risk of sharp depreciation in such circumstances); (iii) portfolio adjustment arguments (eg the monetary authority wishes to adjust the currency holdings of its portfolio without affecting the exchange rate); and (iv) arguments based on second-generation currency crisis models - the central bank may have an incentive to conceal its intervention operations because it has poor credibility for sending trustworthy signals.

¹⁰ Neely (2001) found similar proportions of central banks intervening secretly to maximise vs minimise market impact, but in his sample no central bank cited portfolio adjustment or avoiding one-sided bets as reasons for secret interventions.

However, most central banks advised against massive secret interventions or an overall strategy of secrecy.

Table 6

Effectiveness of secret interventions¹

Interventions conducted secretly (for reasons specified in columns) are ...	To maximise market impact	To minimise market impact	For portfolio adjustment	Other reasons
Effective most of the time	5	2	1	0
Sometimes effective	3	0	0	1
Never (or rarely) effective	0	0	0	0

Total number of responses: 20 out of 23: three central banks do not intervene; 10 confirmed secret interventions; seven do not conduct secret interventions (but one of them has the authority to do so); three empty responses.

¹ Number of central banks responding to the question.

Source: Central bank responses to the BIS questionnaire.

2. Other external effects of intervention

Reserve accumulation, credit ratings and external vulnerabilities

Unlike in most industrial countries, many central banks in the emerging market economies consider reserve accumulation a legitimate and important goal of official intervention. Following recent currency crises - including those in Asia, Argentina, Brazil, Mexico, Russia and Turkey - many central banks have come to regard high foreign exchange reserves as a key buffer against external vulnerabilities and debt sustainability problems. Moreover, many central banks have come to realise that attempts to prevent the exchange rate from depreciating when other macroeconomic policies are not tightened may in the end increase the probability of a crisis.

Table 7

External implications of reserve accumulation

	Major positive impact	Some positive impact	No impact
Effect of reserve accumulation on sovereign credit ratings	Indonesia, Venezuela	Argentina, Brazil, India, Korea, Malaysia, Mexico, Peru, Philippines, Poland, South Africa, Thailand, Turkey	Colombia
Effect of reserve accumulation on external sustainability	Argentina, Brazil, Colombia, Indonesia, Korea, Malaysia, Peru, Turkey, South Africa	Mexico, Philippines, Poland, Venezuela	

A total of 16 central banks (out of 23) responded (three central banks do not intervene).

Source: Central bank responses to the BIS questionnaire.

Findings on the impact of reserve accumulation on credit ratings and external vulnerability from this survey confirm the “buffer” view. Indeed, all 16 central banks that provided the answers reported in Table 7 believe that reserve accumulation has at least some positive impact on either sovereign credit ratings or external sustainability (or both). The impact on credit ratings is judged to be more moderate than the impact on external sustainability, but nevertheless sufficiently important to be taken into account. Only in Colombia have credit ratings not improved in the period of reserve accumulation.

Only one central bank stated explicitly that its intervention had never been guided by the objective of accumulating official reserves. In contrast, three central banks noted that building foreign exchange reserves was the only reason why they have conducted interventions over the past year or so - the impact of such interventions on the exchange rate was virtually nil.

Several central banks, including some that operate under floating exchange rate regimes, commented that higher reserves gave them greater confidence and credibility in foreign exchange markets (“large reserves are respected by financial markets”). This helped improve the sustainability of their external positions - and hence their credit ratings - through several channels. A higher reserves level implied greater capacity to redeem external debt (in particular short-term debt), and reduced the risk of speculative attacks on the currency, given that markets regard reserves as a contingent stock for intervention purposes. It also reduced international funding costs in a number of emerging economies. Several central banks felt that reserve accumulation acted as insurance against the negative effects of debt and financial sector crises. In EU accession countries, the higher level of official reserves helped mitigate an increase in external vulnerability stemming from liberalisation of capital flows - in particular short-term flows. Most central banks have also noted that rating agencies generally view the steady trend of reserve accumulation as a result of the underlying strength of the economy.

Despite a general perception that reserve accumulation can improve credit ratings and reduce external vulnerabilities, several central banks noted that macroeconomic fundamentals seem to play the key role. In particular, it is very difficult to assess the role of reserve accumulation in this process against the background of a better macroeconomic environment as a whole, including solid global growth, stronger external positions and the pursuit of sound fiscal and monetary policies by many emerging economies in recent years.

Two central banks were not convinced by the argument that reserve accumulation provided a cushion against contingencies or could impress rating agencies. One of them argued that reserves mattered for sovereign credit ratings only during the period when countries were passing from the speculative to the investment grade rating. Another noted that running down central bank liabilities was a more sensible approach than accumulating assets, which inevitably raised questions about the optimal level of reserves.

Intervention and rules affecting foreign exchange transactions

The insurance motive is also visible in the widespread use of rules affecting foreign exchange transactions to supplement official intervention. Some Asian emerging economies often combine foreign exchange intervention with capital controls, prudential regulations and other rules such as foreign currency surrender requirements (Table 8). Countries that do not use foreign exchange rules in conjunction with official intervention nevertheless often use capital controls and prudential regulations to monitor or “influence” external exposures, in particular open foreign exchange positions of financial institutions.

Central banks were also asked to assess the impact of foreign exchange rules on the effectiveness of intervention. A number of Asian central banks found that capital controls and foreign exchange regulations enhanced the effectiveness of intervention. In several countries, the use of temporary or new rules during certain episodes of turbulence in foreign exchange markets was judged to improve the effectiveness of intervention.

Central banks provided a number of arguments supporting the use of additional rules on foreign exchange transactions. One central bank noted that capital controls were used to increase the effectiveness of intervention when the inflows or outflows threatened to be very large. For instance, limits on net foreign cash positions of financial institutions, as a percentage of their net worth, were

designed by some central banks to limit the capacity of the financial intermediaries to convert significant debt or forward positions into spot cash flows, which could have a large and sudden effect on the exchange rate.¹¹ Another central bank observed that, in periods of downward pressure on the currency, tightening of prudential regulations tended to dampen the demand for foreign currency. As a result, the depreciation pressure on the domestic currency generally eased. Moreover, the size of intervention needed to bridge the supply gap became smaller, given that the speculative demand fell.

Table 8

Intervention and other rules on foreign exchange transactions

Foreign exchange intervention is used in conjunction with ... (see columns)	Capital controls			Prudential regulations	FX surrender requirements or other FX controls
	Controls on outflows	Controls on inflows	Restrictions on non-residents' access to domestic currency/assets		
Often used together	Indonesia, Malaysia	Indonesia, Malaysia	Indonesia, Malaysia	Indonesia, Korea, Malaysia	
Sometimes used together	Argentina, India	India	India	Brazil, Colombia, India, Philippines, Thailand, Venezuela	India, Thailand
Never used together	Czech Republic, Hong Kong SAR, Hungary, Korea	Czech Republic, Hong Kong SAR, Hungary, Korea, Venezuela	Czech Republic, Hong Kong SAR, Hungary, Korea	Chile, Czech Republic, Hong Kong SAR, Mexico, Philippines, South Africa	Czech Republic, Hong Kong SAR, Korea, Peru, Mexico

Number of observations: 15 out of 23. Three central banks in the sample did not intervene during 2002-2004 Q3.

Source: Central bank responses to the BIS questionnaire.

Some central banks also felt that the adoption of complementary measures could affect expectations by underlining official resolve to bring stability to the foreign exchange market. Such actions also signalled to market participants that unwelcome exchange rate movements would not be allowed to threaten the fulfilment of key central bank objectives, such as the inflation target.

Some central banks that officially operate a free or a managed floating system noted that specific capital controls helped them make smaller the capital flows that might otherwise have caused a shock to thin foreign exchange markets. In particular, some official guidance was deemed helpful in the case of flows originating from large public sector firms. In one case, the central bank introduced temporary quantitative restrictions on short-term deposits in order to alleviate pressure for currency appreciation. As the pressure subsided, the restrictions were lifted.

However, several central banks were sceptical about the usefulness of foreign exchange regulations in enhancing the effectiveness of intervention. In one country, attempts to support interventions in the foreign exchange market with capital controls eventually led to the collapse of the float and reintroduction of comprehensive administrative controls. Several other central banks argued that capital controls and foreign exchange regulations impeded the development of domestic financial markets. For instance, the authorities in several countries realised that repatriation of offshore

¹¹ Similar measures were used for instance by France, Portugal and Spain during the ERM crisis in 1992–93; see BIS (1993).

business could help develop the domestic financial market and decided to lift most restrictions. Domestic firms and pension funds became better hedged as a result and investors less confused about the authorities' policy intentions. Particularly helpful was the policy of allowing domestic institutional investors access to foreign assets - it helped reduce pressures from capital inflows much more effectively than restrictions on inward capital flows. The removal of capital controls in one country improved liquidity not just in the foreign exchange market, but also in the government bond and equity markets.

Intervention and dollarisation

Many developing countries had a long history of macroeconomic instability during the 1970s and 1980s, which has led to the emergence of widespread dollarisation. While many of them have since turned the corner, achieving stable single-digit rates of inflation in recent years, some still have to cope with a high level of dollarisation. This creates various complications for monetary policy, including official intervention. If there are no major exchange controls, the high degree of substitutability between domestic and foreign currency should prevent the market exchange rate from deviating from fundamentals, making the signalling channel of intervention much more important. Under these circumstances, it has been observed that greater credibility of monetary policy can set in motion a virtuous circle that leads to gradual de-dollarisation.

In Turkey, for instance, rapid disinflation in recent years has had a favourable impact on inflation expectations. As the Turkish lira stopped depreciating and started to strengthen against the dollar after the 2001 crisis, households and firms have started to sell some of their foreign exchange holdings, making it easier for the central bank to purchase the foreign exchange it needs to repay external debt and replenish reserves (see Özatay in this volume). Conversely, whenever markets were in a vulnerable position due to political instability, dollarisation would resume and there was little the central bank could do to stop the process, as a high volume of the assets was beyond its control.

On the hand, dollarisation can sometimes facilitate intervention by reducing the risk that agents will shift out of local currency. This effect was observed on some occasions in Indonesia, Peru and the Philippines. As individuals and businesses were already able to keep part of their assets in foreign currencies, there was less need in the economy as a whole to buy foreign currencies from the market for hedging purposes or for servicing external debt liabilities.

Some central banks recognised, however, that a marked degree of financial dollarisation heightened the risk of balance sheet effects stemming from exchange rate fluctuations, as some agents in the economy (including the public sector) are likely to have currency mismatches between their assets and liabilities. In such circumstances, official intervention may be an important channel for providing liquidity to the economy and minimising the disruptive effect of large depreciations on private balance sheets. For instance, during the market turbulence in 2001-02, the Central Bank of Brazil intervened in the foreign exchange market by both directly selling foreign currency in the spot market, and providing foreign currency indexed instruments in the futures markets. Such interventions proved effective. However, they were temporary and were part of a broader strategy that involved other policies, whose objective was not to target the exchange rate level but to provide liquidity to the economy.

Conclusion

Does the central bank survey presented in this paper support the widespread view that intervention is more effective in emerging market economies? Unfortunately, no definitive answer can be given.

The survey does show that many central banks in emerging markets view intervention as an effective tool within their monetary policy framework. However, to be effective intervention needs to be aligned with macroeconomic and financial market conditions, central banks believe. If the exchange rate is depreciating because of weak fundamentals, intervention will not help stabilise it for very long. Currency appreciation is perhaps easier to resist, but even in this case some central banks point to limits to intervention where markets are aware of the costs of intervention for central banks. In general, it seems that intervention cannot affect the exchange rate on its own; the main burden in stabilising the exchange rate is primarily on monetary policy and often on fiscal policy as well.

Central banks report that intervention used to accumulate official reserves can be effective in improving sovereign credit ratings and reducing external vulnerabilities. However, the positive effect on credit ratings seems to work only for countries that do not already have an investment grade rating. Views on the usefulness of various restrictions on foreign exchange transactions to supplement official intervention are mixed. Those central banks that had removed capital controls feel that this move had spurred the development of domestic foreign exchange and capital markets. Markets have become more liquid and domestic agents better hedged against foreign currency risks. But many central banks that have kept some foreign exchange and capital controls feel that these controls are useful, in particular when the foreign exchange market is under stress. Most feel that such controls have to be simple and of limited duration to be effective.

Annex

Table A1 Foreign exchange turnover¹

	Reported by dealers in the country of issue			Total ²		Official reserves / daily turnover	
	1998	2001	2004	2001	2004	2001	2004
Latin America							
Argentine peso	2,131	n.a.	684	n.a.	684	n.a.	20.7
Brazilian real	3,418	4,612	3,127	5,239	4,344	6.6	11.5
Chilean peso	1,212	2,282	2,314	2,282	2,314	6.3	6.7
Colombian peso	n.a.	371	669	371	669	24.5	16.0
Mexican peso	6,961	5,888	10,059	10,086	20,312	4.0	2.9
Peruvian sol	n.a.	203	251	203	251	40.5	40.1
Asia							
Hong Kong dollar	14,833	19,016	19,967	27,381	33,181	4.2	3.7
Indian rupee	1,337	2,762	5,313	2,840	6,066	14.0	18.6
Korean won	2,288	7,916	15,815	9,757	21,151	9.5	7.7
Taiwan dollar	1,658	2,609	3,869	3,167	7,261	35.3	31.4
Indonesian rupiah	850	535	1,419	552	2,051	50.4	17.3
Malaysian ringgit	579	923	987	923	987	27.3	52.8
Philippine peso	408	455	523	502	765	24.6	17.3
Singapore dollar	16,819	9,841	8,751	12,886	17,010	5.9	5.8
Thai baht	2,123	1,274	2,088	1,859	3,492	16.9	11.9
Central and eastern Europe							
Czech koruna	4,169	1,135	965	2,234	2,813	5.9	9.3
Hungarian forint	528	173	1,380	197	3,625	55.7	3.2
Polish zloty	910	3,376	3,400	6,325	7,031	4.4	5.1
Russian rouble	4,519	4,158	10,631	4,282	12,208	6.5	6.5
Other emerging markets							
Israeli shekel	n.a.	506	1,969	506	1,969	46.3	13.5
Turkish lira	n.a.	231	1,439	433	1,991	41.8	17.0
Saudi Arabian riyal	1,235	840	689	840	689	17.7	26.1
South African rand	6,087	6,846	5,682	11,327	13,656	0.5	0.6
Total above currencies	72,065	75,952	101,991	104,192	164,520	21.6³	14.6³
Memorandum							
Australian dollar	19,638	20,076	27,046	49,653	97,123	0.3	0.3
Swedish krona	4,847	11,466	13,811	30,146	40,639	0.4	0.4
Swiss franc	21,748	17,767	21,143	71,053	107,705	0.4	0.4
Total (all currencies)	1,429,284	634,650	943,542	1,173,066	1,773,275

n.a.= not available

¹ Daily averages during April, in millions of dollars. Figures are the sum of spot, forwards and foreign exchange swaps in local and cross-border transactions, adjusted for local and cross-border double counting.

² Reported by dealers both inside and outside of country of issue. ³ Simple average.

Source: BIS, *Triennial central bank survey of foreign exchange and derivatives market activity in 2004*.

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The effectiveness of foreign exchange intervention in emerging market countries¹

Piti Disyatat and Gabriele Galati

1. Introduction

This paper attempts to provide a comprehensive overview of what is known about the effectiveness of foreign exchange intervention in emerging market countries. This is done in two steps. First, an extensive review of the literature on this topic is conducted. Second, new evidence from a systematic study in the context of the Czech Republic using actual intervention data is presented.

A major stumbling block in assessing the effectiveness of intervention in emerging markets has been a lack of data. In constructing an overview of the results, it is therefore useful to combine the evidence that is available with the sizeable literature from advanced economies and to take into account specific institutional differences that may lead to considerable divergence in the effectiveness of intervention. Indeed, differences in the exchange rate regime pursued, the history of policy actions, the depth and sophistication of the foreign exchange market, and regulatory controls on various aspects of foreign exchange transactions, can significantly influence the impact of intervention.

That foreign exchange intervention appears to be more common in emerging market countries is partly a reflection of structural characteristics of such economies that often contribute not only to greater exchange rate volatility, but also to larger effects of such fluctuations on the real economy. Indeed, when the foreign exchange market is thin and dominated by a relatively small number of agents, it is likely that the exchange rate will be volatile if the authorities do not provide some guidance and support. This problem is compounded if there is no track record of stable macroeconomic policies that can firmly anchor market expectations about future monetary and exchange rate policy. Underdeveloped and incomplete financial markets also imply that hedging against exchange rate risk is costly and sometimes impossible, so that the costs of exchange rate volatility can be substantial for individual agents and for the economy as a whole.

Not surprisingly, the attitude of policymakers towards the exchange rate in emerging markets generally differs from that in industrial economies.² These differences, to some extent, also reflect alternative development strategies. For example, the reliance on export-led growth in East Asia during much of the 1980s and early 1990s meant that exchange rate policies in the region were geared towards maintaining export competitiveness, especially in the face of strong capital inflows. The heavy weight accorded to stabilising the exchange rate often occurred at the expense of greater volatility in other macroeconomic variables. Indeed, that developing countries tend to tolerate greater volatility in international reserves, domestic interest rates and commodity prices than in exchange rates has been documented by Calvo and Reinhart (2002).³ It is important to keep in mind this background in reviewing the literature on emerging market countries.

The empirical contribution of the paper is an analysis of the impact of intervention by the Czech National Bank (CNB) on the koruna/euro exchange rate during 2001-02. The focus is on the level of the exchange rate, the implied volatility and risk reversals (ie market participants' bias between a

¹ This paper was written while Piti Disyatat was a Visiting Fellow at the BIS. We would like to thank Marian Micu for excellent research assistance, Claudio Borio, Martin Perina, Camilo Tovar and Philip Turner for helpful comments on an earlier version, and John Cairns for kindly providing us the IDEA data on intervention by Asian central banks that is perceived by market participants. All remaining errors are our sole responsibility. The views expressed are our own and do not necessarily reflect those of the Bank of Thailand or the Bank for International Settlements.

² A discussion of intervention objectives in the emerging market context can be found in the Moreno paper in this volume and in Canales-Kriljenko et al (2003). King (2003) offers a more general discussion based on experiences of advanced countries. A survey of empirical studies on the determinants of intervention can be found in Almekinders (1995) and Sarno and Taylor (2001).

³ See also Ho and McCauley (2003).

much stronger and a much weaker koruna/euro rate). A comprehensive data set of news about macroeconomic variables and policy decisions is used to help distinguish the effect of intervention from that of the arrival of other relevant information. The simultaneous determination of intervention and market expectations is taken into account through estimation of instrumental variables where estimates of the CNB's reaction function are used as instruments.

The results suggest that during the period 2001-02, the Czech authorities appeared to intervene mainly in response to an acceleration of koruna appreciation. These interventions had some weakly statistically significant impact on the spot rate. Consistent with the results for the spot rate, intervention had, on average, a weakly statistically significant effect on the risk reversal. Hence, following sales of korunas against euros, market participants tended to put more weight on a weaker rather than a stronger koruna. However, in economic terms, the impact on the spot rate and the risk reversal is small. Finally, intervention had no significant influence on implied volatility, indicating that, in general, central bank intervention was not followed by an increase in uncertainty in the market about future exchange rate movements.

The outline of the paper is as follows. Section 2 discusses some of the reasons why foreign exchange intervention may be more effective in emerging market countries, while Section 3 provides a comprehensive review of existing studies on the effectiveness of intervention in this context. The empirical results using Czech data are presented in Section 4, and Section 5 concludes.

2. Why might intervention be more effective in emerging market countries?

In thinking about how intervention may be effective, it is useful to conceptualise the exchange rate as an asset price. From this perspective, the current exchange rate depends on present and expected future fundamentals. A strand of research has also highlighted the susceptibility of exchange rate movements, at least in the short run, to non-fundamental factors such as herd behaviour, information cascades and speculation (Frankel and Froot (1990); Allen and Taylor (1992)). In this context, intervention might affect the spot exchange rate either through its impact on current fundamentals, expectations about future fundamentals, or expectations not based on fundamentals. The literature has focused discussion of these effects through four broad mechanisms: the monetary channel, the portfolio balance channel, the signalling channel and the microstructure or order flow channel.⁴

In the context of managed floating regimes, the usefulness of intervention depends on whether or not exchange rates can be influenced independently of the monetary policy stance since only in this case will intervention constitute a truly separate policy instrument.⁵ As such, much of the focus in the literature has been on whether interventions that are sterilised (ie not backed by changes in monetary policy) have any significant effect. While the standard textbook distinction between sterilised and unsterilised intervention is based on a quantity criterion (the impact on base money), in practice the relevant condition is whether or not interest rates are affected. Since both the demand for and supply of base money changes significantly day to day due to autonomous factors, maintaining short-term interest rates does not always require that the entire amount of intervention be offset in the domestic money market. Mohanty and Turner (in this volume) note that when interventions in the foreign exchange market are small, or net positions reverse quickly, preserving the stance of monetary policy through sterilisation operations will be comparatively easy. By contrast, in the case of interventions involving large amounts or being carried out repeatedly in the same direction, the conflict between monetary and exchange rate objectives is harder to resolve.

With respect to the portfolio balance channel, one would not expect the effect to be very strong in advanced countries because typical intervention transactions are minuscule relative to the stock of

⁴ In a paper published in this volume, Archer also discusses a coordination channel. This channel is based on central bank intervention's ability to disrupt autoregressive (trend following, momentum) trading strategies and thereby to coordinate trading in the direction of equilibrium.

⁵ The paper by Mohanty and Turner in this volume provides a discussion of the domestic implications of foreign exchange market intervention.

outstanding assets. In addition, the degree of substitutability between domestic and foreign currency bonds tends to be quite high (Dominguez and Frankel (1993)). Galati and Melick (2002) argue that the portfolio channel may be more relevant for emerging markets because they are more likely to have large reserve portfolios relative to local foreign exchange market turnover or the stock of domestic bonds outstanding. Moreover, given that the degree of substitutability between emerging market currency debt and foreign currency debt is generally smaller - as reflected in higher risk premia on the former - the portfolio balance effect may also be stronger in these countries.

By contrast, it has been argued that the signalling channel is likely to be weaker in emerging market countries since central banks there have a shorter history of institutional and policy credibility than their counterparts in industrial economies. As such, they may have to make up for this by undertaking larger interventions (Canales-Kriljenko et al (2003)). Indeed, in their analysis of intervention in Mexico and Turkey, Domaç and Mendoza (2002) found that monetary policy signals to the market do not seem to affect either the level or the volatility of the exchange rate. Tapia and Tokman (2004), on the other hand, found public announcements of imminent intervention by the Central Bank of Chile to be effective in influencing both the level and the trend of the exchange rate, which may reflect the high credibility of the central bank. It is therefore unclear whether the ability of central banks to convey policy signals is more or less effective in emerging market countries.

It is possible, however, that central banks in emerging market countries may have a better grasp of aggregate market conditions than domestic market participants if local markets are not very developed and remain highly segmented. This advantage may also arise from reporting requirements that give central banks in these countries a better picture of aggregate order flows and dealers with large net open positions. In this setting, and in line with the microstructure/order flow channel, intervention can be timed and conducted in a manner that potentially increases its market impact.⁶ Under this channel, the size of intervention relative to market turnover is an important determinant of its effectiveness, which suggests that this channel may be more effective in emerging market countries where markets are less liquid. As documented by Ho and McCauley (2003), foreign exchange markets in most emerging market economies do tend to be relatively small, with bid-ask spreads that appear to be less uniform (both across currencies and across time) and wider than those among industrial country currencies, indicating less liquidity.⁷

Finally, in the current East Asian context, interventions may be more effective simply because they have tended to be undertaken in the same direction at roughly similar times. Interestingly, data on intervention that is perceived by traders suggest a link between intervention by the Bank of Japan and that of other central banks in the region which has increased in significance over 2003-04.⁸ Probit estimates presented in Table 1 highlight this. The interventions appear to be more coincidental than coordinated, reflecting a concern for each country's respective effective exchange rates in the face of US dollar weakness and a resurgence of capital inflows into the region. While a lack of interventions data makes it difficult to test directly whether such common intervention are more effective, there is a perception that these interventions, which have been associated with large foreign reserve accumulation, have had at least some success in making the US dollar depreciation more gradual than it otherwise might have been.⁹

⁶ Scalia (2004) studied the effectiveness of intervention on Czech data from a microstructure perspective and found significant impact of order flow on the exchange rate. For industrial countries, the literature on the microstructure of exchange rate intervention is substantial with the broad conclusion being that central banks' intervention has significant impact on the first two moments of the exchange rate (eg Evans and Lyons (2001), Dominguez (2003) and Payne and Vitale (2003)).

⁷ Canales-Kriljenko (2003) provides some survey evidence about the relative size of typical intervention in developing countries relative to market turnover.

⁸ Data on foreign exchange intervention conducted by central banks in emerging market countries in Asia that is perceived by market participants were provided by IDEA. The data are daily and include information on the currencies that were traded as well as estimated amounts.

⁹ For an analysis of reserve accumulation in the Asian region see, for example, BIS (2004).

3. Existing empirical evidence

3.1 Advanced countries

Despite greater availability of high-frequency intervention data, the empirical evidence on the effectiveness of intervention for advanced countries remains mixed.¹⁰ Where foreign exchange intervention has been found to be effective, the magnitudes differ substantially across studies. The problem stems not only from differences in the data and methodology employed, but also from difficulties in defining a “successful” intervention. In particular, much disagreement exists about the size and persistence of measured effects on the level and volatility of the exchange rate that constitutes success. This is partly a reflection of the absence of a reliable model of exchange rate determination that can be used to proxy the exchange rate path that would have obtained in the absence of intervention. Moreover, the objective of central bank intervention can change between intervention episodes so that the true success criteria may be time-varying. Indeed, one weakness of the literature on effectiveness of intervention is the implicit assumption that central banks’ objective functions are stable across episodes of intervention.¹¹ Given the absence of direct data on why central banks intervene, a certain degree of judgment is needed in interpreting empirical evidence on the effectiveness of these operations.

Table 1
**Relative frequency of intervention:
coincidence with Bank of Japan intervention**
Probit analysis

	2003-04
Hong Kong SAR	0.076 (1.19)
Korea	0.39 (6.19)
Philippines	0.02 (0.33)
Singapore	0.05 (0.78)
Taiwan, China	0.33 (5.28)
Thailand	0.11 (1.78)

Note: The table shows the probability of the joint perceived intervention in an emerging market country and actual Japanese Ministry of Finance intervention obtained from a probit regression. The dependent variable is a dummy which takes the value of one for days with perceived emerging market interventions and zero otherwise. The independent variables are a constant and a dummy for the Japanese Ministry of Finance intervention. T-statistics are presented in parentheses.

Sources: IDEA; Japanese Ministry of Finance; BIS calculations.

¹⁰ For extensive literature reviews, see Edison (1993), Almekinders (1995), Schwartz (2000), Sarno and Taylor (2001) and Humpage (2003).

¹¹ Some exceptions include Hung (1997) and Fatum and Hutchison (2003). The former divided intervention data into two sub-periods based on different perceived objectives of the Federal Reserve, while the latter examined several definitions of success and concluded that intervention appears to be effective according to different objectives. Galati and Melick (2002) also studied the effectiveness of intervention with respect to G3 currencies where the sample was conditioned on periods where the objectives were believed to be broadly consistent.

Overall, the evidence on advanced countries suggests that the bulk of the impact of intervention on the level of the exchange rate occurs during the day in which it is conducted, with only a smaller impact on subsequent days. With respect to volatility, the impact on implied volatility is found to be sample-dependent (Bonser-Neal and Tanner (1996), Dominguez (1998)) or strategy-dependent (Murray et al (1997)). Findings that intervention increases exchange rate volatility (Bonser-Neal and Tanner (1996) and Cheung and Chinn (1999)) suggest perhaps that the simultaneity problem has not been entirely corrected for (that is, intervention takes place at times when volatility is high). Or these findings could be a reflection of new information being transmitted to the market by the central bank. If the goal of intervention has primarily to do with the level of the exchange rate, however, then such volatility spikes do not necessarily indicate ineffectiveness of intervention.

Finally, a more recent focus has been on utilising information from options to infer the effects of intervention on higher moments of the exchange rate. An attractive feature of this approach is that it yields direct evidence on intervention's impact on market participants' beliefs and expectations. Notwithstanding slight differences across sample, most of the results suggest that central bank intervention had no statistically significant systematic impact on the mean or higher moments of the exchange rate (Galati et al (2005)).

3.2 Emerging market countries

Although the empirical literature on emerging market countries where data limitations are much more severe is still relatively scant, some recent work does help to at least provide a broad sense of intervention's effectiveness in these countries.¹² Most prominently, and not altogether surprisingly, the effectiveness of intervention is highly sample-dependent with conclusions varying significantly across countries. That said, the evidence also highlights some broad similarities. In particular, the effectiveness of intervention appears to be dependent on the monetary policy framework pursued and whether the intervention is publicly announced or not. Tapia and Tokman (2004), for example, studied the effectiveness of intervention in Chile using both daily and intraday data. Their analysis indicated that the effectiveness of intervention operations varied throughout the sample in line with the changing policy framework of the central bank, with public announcements playing a bigger role after 2001. Similarly, Guimarães and Karacadag (2004) and Holub (2004) emphasised the role of public announcements in the case of Mexico and Turkey and that of the Czech Republic, respectively. Another general observation is the asymmetry associated with intervention's effectiveness. Barabás (2003), for example, provides an account of how intervention by the Hungarian central bank successfully defended the strong edge of the exchange rate band arguing that it may be more feasible to resist appreciation than depreciation. Likewise, Domaç and Mendoza (2002) also found asymmetric effects in the case of Mexico and Turkey. Finally, there appears to be a link between the depth and sophistication of the capital market and the effectiveness of intervention as discussed, for example, by Rhee and Song (1999) in the context of Korea, where it was found that as the capital market became more open, intervention policies appeared to become less effective.

In terms of the impact of intervention, the evidence is more clear-cut with respect to the volatility than the level of the exchange rate. Among those that found a significant effect on the level, Domaç and Mendoza (2002) concluded in the context of Mexico and Turkey that central bank foreign exchange sales (but not purchases) were generally effective in influencing the exchange rate in both countries. In particular, a net sale of USD 100 million caused the exchange rate to appreciate by 0.08% on average in Mexico and 0.2% in Turkey. In their study of the Chilean experience, Tapia and Tokman (2004) found that although actual intervention appeared to have a small and generally insignificant effect on contemporaneous exchange rate movements, public announcements of potential interventions had significant effects on the level and trend of the exchange rate. Similarly, Rhee and Song's (1999) study of Korean exchange rate policy during the pre-1997 crisis period found that sterilised intervention had a significant short-run effect on the exchange rate level that lasted for about one week. Ryu (2003) also found that intervention transactions - but not public announcements - by The Bank of Korea were effective in pushing the exchange rate in the desired direction.

¹² A comprehensive analysis of central banks' views on effects of intervention can be found in Mihaljek in this volume. Mihaljek based his analysis on central bank responses to a BIS questionnaire, interviews with central bank staff, and studies of intervention by central banks from emerging market economies that are published in this volume.

In contrast, Guimarães and Karacadag (2004) find only weak supportive evidence for the effectiveness of intervention on the level of the exchange rate in Mexico and Turkey. Given policy objectives, however, such findings do not necessarily indicate a failure of intervention. For example, the bulk of intervention undertaken in Mexico during the sample period was aimed at accumulating reserves rather than influencing the underlying exchange rate trend. In Turkey's case, the apparent ineffectiveness of intervention in influencing the level of the exchange rate may reflect the nature of intervention policies there. In particular, the vast majority of official interventions were conducted in the context of preannounced foreign exchange auctions, where the timing and amounts were largely predetermined and known by market participants. Hence, the potential impact of interventions may have operated through the signalling channel well in advance of actual interventions themselves. Based on the analysis of monthly data, Pattanaik and Sahoo (2003) concluded that intervention operations of the Reserve Bank of India had very little perceptible influence on exchange rate levels. Similarly, using Granger causality tests, Sahadevan (2002) concluded that interventions by the Reserve Bank of India did not have any significant causal relationship with monetary variables and the exchange rate. In an interesting study, Sangmanee (2003) utilised option-implied probability density functions to examine whether intervention instantaneously influenced market expectations regarding the sustainability of Thailand's fixed exchange rate regime prior to the 1997 crisis. The results indicated that spot interventions did not have a statistically significant contemporaneous impact in this regard, although they were associated with a decrease in the kurtosis (ie likelihood of a very large change in either direction) of expected exchange rate returns. Finally, a number of studies found mixed results with respect to intervention's impact on the level of the exchange rate including Holub (2004), Barabás (2003) and Abenoja (2003) for the Czech Republic, Hungary and the Philippines, respectively.

With respect to the impact of intervention on exchange rate volatility, the evidence is generally more positive. Domaç and Mendoza (2002) found in the context of Mexico and Turkey that intervention reduced exchange rate volatility in both countries. Pattanaik and Sahoo (2003) also concluded that intervention operations of the Reserve Bank of India had been effective in containing volatility of the rupee, although the degree of influence did not appear to be very strong. For the Philippines, Abenoja's (2003) study using daily intervention data from 1992 to 2003 indicated that although intervention reduced volatility contemporaneously, persistent operations actually increased volatility. This might suggest that successive interventions lead to greater market uncertainty. Less encouragingly, Mandeng (2003) analysed the experience of option-based foreign exchange intervention in Colombia through an event study method and an analysis of variance model and found that these have only been moderately successful in reducing exchange rate volatility. Moreover, the effects were not persistent and, after a 10-day lag, intervention did not appear to significantly affect volatility. The relative ineffectiveness was attributed to suboptimal contract specifications. For Mexico and Turkey, and in contrast to Domaç and Mendoza (2002), Guimarães and Karacadag (2004) also did not find a significant impact of intervention on exchange rate volatility.

4. Empirical study

This section outlines some of the challenges posed by empirical studies of intervention's effectiveness and presents new estimation results using actual daily intervention data from the CNB. Overall, the results indicate that intervention can have a statistically significant impact on the level but not the volatility of the exchange rate, as well as influence market expectations about its future direction, although the effect can be quite small and not very long-lasting.

4.1 Estimation strategies

A wide array of techniques has been employed to assess the effectiveness of intervention. Relatively recent surveys of these methodologies can be found in Humpage (2003) and Sarno and Taylor (2001). In general, it is not possible to disentangle precisely the channels through which intervention works. The focus has rather been on the overall impact of such operations. The single most important problem that confronts all empirical research on intervention is the simultaneous determination of official intervention and exchange rate changes. The central hypothesis is that intervention affects the exchange rate, but the decision to intervene is not independent of the movements in the exchange rate. Also, once a central bank has decided to intervene, the magnitude and timing will typically depend on the response of the exchange rate to its trades. Time series analysis or regression-based event

studies typically set up the timing of the data so that intervention occurs before the exchange rate (for example, lagging the intervention term by one period). Given that intervention often affects exchange rates within minutes, extremely high-frequency data are needed.¹³

An alternative way of dealing with the simultaneity problem is to define a success criterion and analyse the frequency of success over a particular time period. This is in the spirit of traditional event studies. Studies based on this method have generally yielded stronger results about the effectiveness of intervention compared to those based on time series techniques (Fatum and Hutchison (2003)). Since this methodology does not control for the effect of changes in other variables, however, studies where the event window is longer than a few days are more susceptible to the simultaneity problem since the likelihood that other factors affecting the exchange rate may enter the window is higher. Another approach would be to adopt an assumption on the central bank's reaction function, although estimates of such reaction functions are hampered by the discrete nature of intervention data. Unless the estimation is done over different sub-periods, such an approach also involves a presumption that the objective of intervention is constant through time, which may not always be appropriate.

A number of studies have tried to circumvent the simultaneity problem by using an indirect gauge of effectiveness suggested by Friedman (1953). The idea is that successful intervention should reverse market trends so that intervention operations are effective on average if the central bank makes a profit on their trades. However, given that central banks sometimes care more about the volatility than the level of exchange rates, and that such analyses do not in any way deal with the simultaneity problem, the conclusions from this approach are at best tenuous. Indeed, that central banks are profitable could simply reflect the fact that they have better timing than the market. Moreover, the horizons over which profitability is measured, as well as the measurement of profit itself, can also influence results substantially.¹⁴

An alternative approach consists in estimating effectiveness by using an instrumental variable approach. Dominguez and Frankel (1993), for example, use such a method, with news that appeared in the financial press about changes in central banks' exchange rate policy as instruments. Galati and Melick (1999) and Galati et al (2005) first estimate a reaction function and then use the fitted values as instruments in regressions that estimate the effect of intervention. Kearns and Rigobon (2002) develop a similar technique for dealing with the simultaneity problem, based on a generalised method of moments, and apply it to Australian data. A similar method is used by Tapia and Tokman (2004).

Finally, a different but related methodology focuses on the link between profits associated with trading rules and intervention. A substantial number of studies have found that fairly simple technical trading rules generate profits that are difficult to explain in terms of standard risk measures. LeBaron (1999) and Szakmary and Mathur (1997) found that these excess returns have generally occurred during periods of central bank intervention, suggesting that the latter introduces noticeable trends in the evolution of exchange rates that, in turn, create profit opportunities. Neely (2002), however, casts doubt on the direction of causality, arguing that interventions tend to arise during periods when exchange rates are trending in a manner that would probably lead to technical trading rule profits.

4.2 An empirical assessment of the effectiveness of intervention in emerging market economies: the Czech case

This section presents an empirical approach to estimating the impact of foreign exchange market intervention on the spot rate and exchange rate expectations in emerging market economies. The case of intervention in the Czech koruna market is used to illustrate the approach. This is an

¹³ Forward obligations of the Bank of Thailand at the end of June 1997 were estimated at around USD 26 billion (IMF (1998)). Forward transactions have also been undertaken by the South African Reserve Bank, though for the most part, these have been motivated by a desire to provide forward cover for export firms rather than to influence the exchange rate (Neely (2001)).

¹⁴ Neely (1998), for example, shows that central banks often make losses in the short run and profits only if the horizon is long enough.

interesting test case because the CNB has followed an explicit inflation targeting regime since 1997 and at the same time intervened in the foreign exchange market on a number of occasions.¹⁵

The CNB recently published a detailed analysis of objectives, strategies and the efficacy of intervention (Holub (2004)). It has also provided information on timing and magnitude of intervention operations to the public.¹⁶ The CNB's interventions have typically been aimed at slowing down the rate of appreciation of the koruna against the Deutsche mark and, since 1999, the euro. Sales of korunas have generally been concentrated in periods lasting several weeks, followed by long periods in which the CNB did not intervene. The most active periods were February to July 1998, October 1999 to March 2000 and October 2001 to September 2002. The first and third periods were characterised by a sharp appreciation and high short-term volatility of the koruna both against the Deutsche mark/euro and in nominal effective terms. In the second period, the koruna appreciated against the euro but weakened in nominal effective terms.

With respect to the transparency of interventions, the CNB announced immediately on a number of occasions that it had entered the market.¹⁷ In other cases, intervention was carried out in a discreet fashion.¹⁸ While a discussion of issues related to the exchange rate is regularly included in the minutes of both regular and extraordinary monetary policy meetings, only in a few cases did these contain explicit information on foreign exchange market intervention.¹⁹

The data

The empirical exercise focuses on daily movements of the koruna against the euro between September 2001 and October 2002, a period in which the CNB intervened frequently. The choice of the sample is also dictated by the availability of data on implied volatility and risk reversals needed to describe market expectations. The exchange rate data are taken at noon in London, quoted in korunas per euro. Data on intervention in the koruna market were provided by the CNB.

Control variables used in the estimation included those that capture the effect of news about macroeconomic or policy developments that may arrive on the same day on which intervention is carried out. The unexpected component of macroeconomic news was measured by the difference between official data announcements and the results of opinion surveys conducted during the days preceding the announcements by Bloomberg. News variables for the Czech Republic included news about CPI, PPI, GDP, industrial production, retail sales, the unemployment rate, construction output and the trade balance. We also used news variables for the euro area, including surprises about the policy rate, as well as surprises on German data for the Ifo index, CPI, PPI, GDP and the unemployment rate.²⁰ Since survey data on expectations of monetary policy decisions by the CNB are not available, we captured the effect of news about changes in Czech policy rates by the percentage change in rates between policy meetings.

¹⁵ The inflation targeting regime was introduced in the autumn of 1997, following a speculative attack on the koruna in May. Holub (2004) notes that the important role of the exchange rate is underpinned by the openness of the Czech economy, with exports of goods and services amounting to 65% of GDP and imported goods accounting for 25% of the consumer basket. Holub also discusses the performance of the CNB in keeping inflation on target and the role of the exchange rate in deviations from the target.

¹⁶ The information can be found on the CNB's website (www.cnb.cz). Starting in July 1998, monthly data on the volume of intervention have been published with a lag of two months. The intervention volume can be also estimated from the CNB's balance sheet, which is published every 10 days.

¹⁷ Episodes that were made public in real time include 31 March 1998, 4 October 1999, 21 January 2002 and 10 April 2002. In a paper published in this volume, Moser-Boehm discusses trends in transparency of central bank operations in the foreign exchange market, basing his analysis on a survey of central bank responses to a BIS questionnaire. In his analysis of tactics and strategies of intervention, Archer (also in this volume) highlights that the main area where different approaches and different attitudes among central banks are evident relates to the visibility of intervention operations.

¹⁸ For example, in December 2001 or July-September 2002.

¹⁹ Examples are the extraordinary meetings on 21 January and 11 July 2002, and the regular meetings held on 4 October 1999, 30 March 2000 and 25 October 2001.

²⁰ We also added macroeconomic news variables for France, but these were generally found not to be significant.

In recent years, data from foreign exchange option markets have been used to extract information on exchange rate expectations and to match them with intervention activity.²¹ Given the liquidity of derivatives markets in the koruna, there was not sufficient data to estimate the entire risk neutral probability density function of the underlying exchange rate as in those studies.²² However, data on spot and forward exchange rates, one-month implied volatility and one-month risk reversals can be used to provide a sufficiently broad characterisation of market expectations. Implied volatility can be interpreted as providing a measure of how uncertain the market is on a given day about the exchange rate that will prevail over the near future. The risk reversal - the price difference between two equally out-of-the-money options - can be interpreted as the weight that market participants put on a much higher and a much lower koruna/euro exchange rate in the near future with respect to the forward rate. It therefore provides a measure of the skewness of market expectations.²³

Intervention and exchange rate expectations

The panels of Graph 1 provide some information on the average movements of the spot rate, the implied volatility and the risk reversal of the koruna/euro exchange rate around intervention episodes by the CNB during the period 3 September 2001 to 1 October 2002. The CNB intervened on 41 days during this period, buying a total of close to EUR 3 billion. On average, it tended to enter the market for a period of about eight days. While the graph gives a broad sense of the effects of intervention over a particular period, it also indicates that the objectives of interventions and the context in which they were carried out varied through time.

Regression analysis²⁴

While the panels of Graph 1 are certainly interesting, one should be careful in using them to draw inferences about the impact of intervention for two main reasons. First, the CNB has at times carried out intervention on several successive days, with the length of the intervention episodes varying quite substantially. The graph does not allow disentangling of the effect of repeated interventions. Second, on the days that the CNB intervened, other important macroeconomic or policy news might have arrived that could have led market participants to react. The behaviour of the variables would then reflect the combined effect of the CNB's intervention activity and the arrival of this macroeconomic or policy news.

In order to assess the effect of intervention and control for these two issues, daily regression analysis is conducted that explains the spot rate, the implied volatility and the risk reversal in terms of current and lagged CNB intervention and other explanatory variables. To distinguish the effect of intervention from the effect of news about relevant macroeconomic variables or monetary policy decisions that may arrive on the same day, a set of variables measuring the unanticipated component of announcements of major macroeconomic variables is included.

The regression equation²⁴ was estimated using instrumental variables in order to correct for potential simultaneity problems, with estimates of a reaction function for the CNB used as the instrument.²⁵

²¹ See, for example, Bonser-Neal and Tanner (1996), Murray et al (1997), Dominguez (1998), Galati and Melick (1999) and Galati et al (2005).

²² In particular, in the absence of a sufficiently liquid market for strangles, risk neutral probability density functions cannot be estimated. A strangle is a financial instrument that consists of a purchase or sale of an out-of-the-money put option and call option on the same underlying instrument, with the same expiration date. A strangle leads to profits if there is a drastic move in either direction of the price of the underlying asset, ie here in the koruna/euro rate.

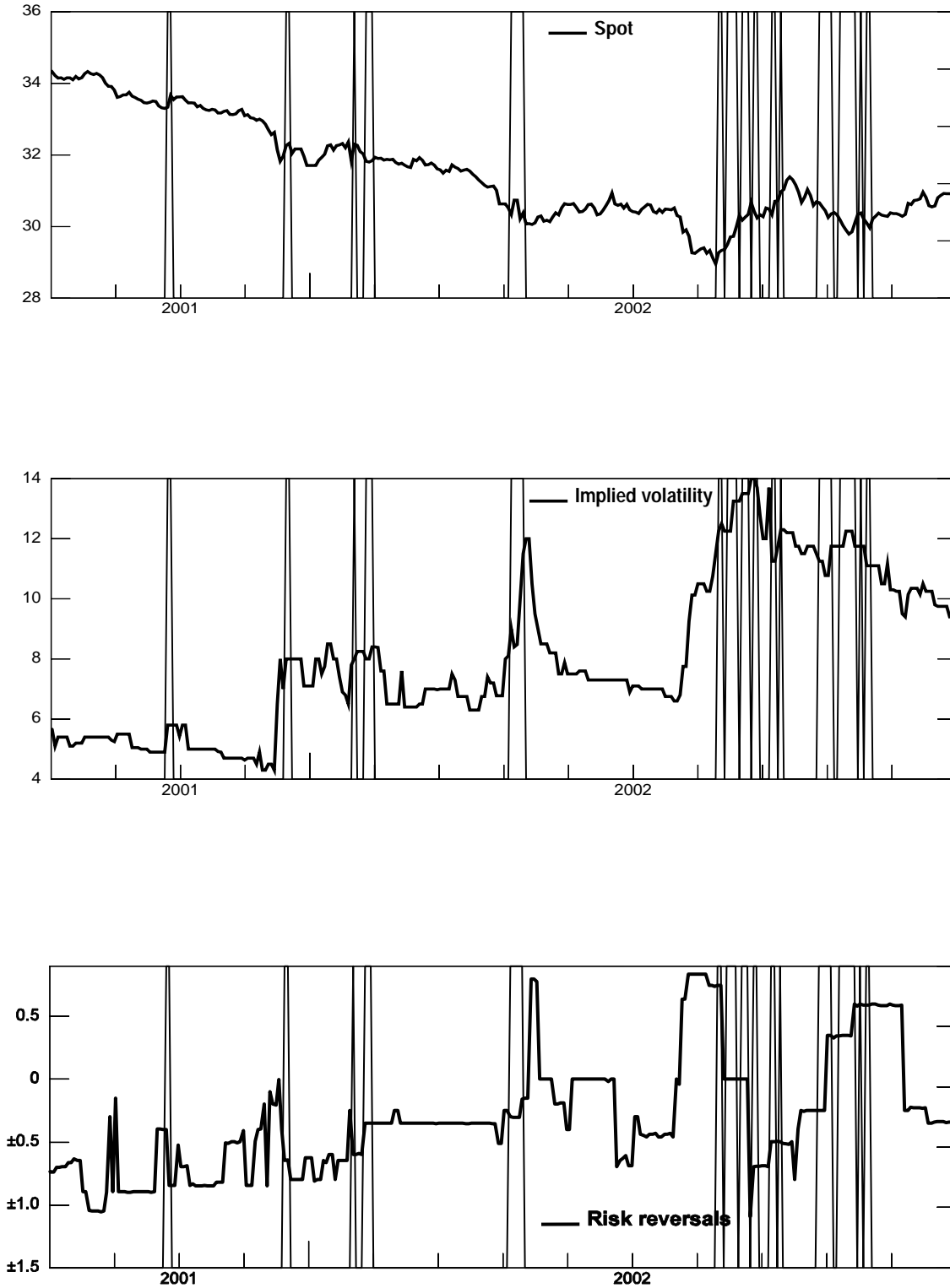
²³ In interpreting the results, it should be emphasised that the interpretation of the option prices is complicated by the fact that they reflect both market views as to the likelihood of particular exchange rate outcomes and market preferences towards risk (see Galati et al (2005)).

²⁴ The discussion in this section is a condensed version of that contained in the Working Paper version of this paper. The reader interested in equation specification and more technical detail is referred to that paper (Disyatat and Galati (2005)).

²⁵ As discussed in Galati et al (2005), the biggest drawback to this approach is the possibility of omitted variables bias in the OLS estimation of the reaction function, since only lagged values of the exchange rate moments are included and the contemporaneous values of the exchange rate moments via an instrument are omitted. However, this bias is likely to be trivial, since the changes in the spot rate, implied volatility and risk reversal show little if any persistence and thus there is not much correlation between the included lagged moments and the omitted instrument for the contemporaneous moments.

Graph 1

**Movements of the koruna/euro spot rate,
implied volatility and risk reversals around CNB
intervention episodes, September 2001-October 2002**



For the purpose of this empirical exercise, it was assumed that the CNB intervened when the spot rate, the implied volatility or the risk reversal deviated from implicit target ranges, with the likelihood of intervention depending on the distance from these targets.²⁶ This is consistent with the main objectives of intervention in a context of floating exchange rates as outlined by Moreno (see Moreno in this volume). In addition, Moreno also discusses the role of intervention in supplying liquidity to the market. As a first approximation, targets for the implied volatility and the risk reversal were set equal to their historical average. The implicit assumption, therefore, is that during the sample period the CNB tended to intervene whenever the variance or skewness of market expectations was abnormally high or low with respect to its historical average.²⁷

The explanatory variables include the distance at time $t-i$ of the koruna/euro spot rate from the bottom of the target range when the exchange rate is below that limit and a variable for the case in which the exchange rate breaks through the top of the target range. In addition, the distance of the variance from its historical average when the euro is, respectively, appreciating or depreciating was included. A variable to measure the distance of the risk reversal from its historical average when the koruna is depreciating and the market is skewed towards a much weaker koruna was also included. Finally, a measure of the distance from the average of skewness when the koruna is strengthening and the market is biased towards a much stronger koruna was used.

The reaction function was estimated over the period September 2001 to October 2002, during which time the CNB intervened on several occasions.²⁸ Table 2 reports the coefficients, t-statistics and significance levels for the reaction functions. The model seems to capture the intervention decisions taken by the CNB during September 2001 to October 2002 reasonably well, as suggested by an R^2 value of 0.18. The results suggest that during the sample period, the CNB tended to intervene mainly when the speed at which the koruna appreciated against the euro tended to increase.

Table 2
**Estimates of the reaction function for CNB
intervention in the koruna/euro foreign exchange market**

Variable	Coefficient	t-statistic	Significance level
Spot ^(H)	0.00	0.00	1.00
Spot ^(L)	45.85	0.35	0.73
Variance ^(H)	2.87	1.01	0.31
Variance ^(L)	125.15	2.78	0.01
Risk reversal ^(H)	151.13	0.99	0.32
Risk reversal ^(L)	-200.35	-1.24	0.22
R^2	0.18		
Number of observations	276		

Note: The table reports coefficients of a model estimated for CNB intervention. It is estimated with OLS using daily data over the period 1 September 2001 to 30 September 2002. Explanatory variables are five lags of the distances of the spot rate, implied volatility and risk reversals from their targets when the euro is appreciating (H) or depreciating (L) with respect to the koruna, as defined in the text. The coefficients on lags two to five of the distances of the moments from their target values are generally not significant and are consequently not reported here.

²⁶ An alternative approach used in the literature consists of setting the implicit target equal to the PPP value of the koruna/euro exchange rate, as in Dominguez and Frankel (1993). This approach appears less useful for the Czech case, since reliable estimates of PPP are very difficult to obtain. Almekinder and Eijffinger (1991) set the target rate equal to past levels of the exchange rate. However, this would amount to assuming that the CNB systematically leaned against the wind.

²⁷ The target bounds are taken here as the historical mean \pm 1.5 standard deviations.

²⁸ The sample period is dictated by the combination of a sufficiently high number of intervention days and the availability of reliable data on option prices.

We estimated the effect of CNB intervention on the spot rate and market expectations (measured by the implied volatility and the risk reversal) using daily data from 1 September 2001 to 30 September 2002. We used instrumental variables, where the instruments include the predicted values of intervention by the CNB taken from the estimated reaction functions just discussed as instruments..²⁹

The specification closely follows that used in Galati et al (2005). The dependent variables of the regression equations are expressed as first differences, while intervention enters in levels on the right-hand side. The explanatory variables also include five lags of intervention in order to capture the dynamics of the short-term effect of intervention, as well as lagged values of the change in the dependent variable. In addition, variables capturing the impact of news about macroeconomic or policy developments were introduced, as described above. In the regression equations for the implied volatility, all explanatory variables are expressed in absolute values, as it is assumed that their impact depends only on their size, not their sign. The results are summarised in Table 3, which reports the coefficient on contemporaneous intervention and the cumulative sum of coefficients on contemporaneous and lagged intervention..³⁰

Table 3

**Estimates of the effect of intervention
on the spot rate, implied volatility and risk
reversals of the koruna/euro exchange rate**

	Spot			Implied volatility			Risk reversals		
	coeff.	t-stat.	sign. level	coeff.	t-stat.	sign. level	coeff.	t-stat.	sign. level
Intervention									
Contemporaneous	0.00	1.24	0.22	0.00	-0.93	0.35	0.00	1.49	0.14
Cumulative	0.01	1.68	0.09	0.00	-0.61	0.54	0.01	1.81	0.07
Macroeconomic announcements in the Czech Republic									
CPI	-1.40	-1.83	0.07	-30.34	-0.31	0.76	-17.33	-0.48	0.63
Retail sales	-0.15	-2.26	0.02	11.88	1.42	0.16	0.01	0.00	1.00
Macroeconomic announcements in the euro area (Germany)									
Industrial production	0.29	1.81	0.07	-21.15	-1.03	0.30	3.72	0.48	0.63
Number of observations	271			271			271		

Note: The regression equation is estimated using daily data. Lags of the dependent variable, all not statistically significant, are not reported here. The sample period is from 1 September 2001 to 30 September 2002.

Table 3 shows that in the regression equation for the spot rate, the coefficient on current intervention is not statistically significant, indicating that, on average during the period 2001-02, CNB intervention in the koruna/euro market had no statistically significant contemporaneous effect on the exchange rate level. However, the cumulative sum of current and lagged intervention is statistically significant at the

²⁹ An alternative instrument for intervention, which has been commonly used in the literature, is lagged intervention.

³⁰ Table 3 reports the regression results for an equation that includes only those macroeconomic news variables that were found to be statistically significant.

9% level, indicating that a cumulative effect of intervention over one week is present but hard to detect empirically. While the cumulative effect of intervention is (weakly) statistically significant, it is very small in economic terms: the combined impact of the contemporaneous level and five lags of intervention on the koruna/euro spot rate is in the order of 25 basis points. This result is consistent with the literature that looks at industrial countries during periods that include the Plaza and Louvre Accords and finds evidence of a statistically significant but economically very small impact (Galati and Melick (2002)). It is also consistent with recent research on intervention aimed at G3 exchange rates and based on event studies (Fatum and Hutchison (2003)). However, it is in contrast with the existing literature that also controls for simultaneity and does not include the Plaza and Louvre periods.

Interestingly, inflation surprises and news about retail sales have a statistically significant impact on the koruna/euro rate. High inflation or retail sales data are on average associated with an appreciation of the koruna, although the effect is very short-lived. Among the euro area news, a positive surprise on industrial production is associated with an appreciation of the euro with respect to the koruna.

The results in Table 3 also show that, on average between September 2001 and October 2002, intervention by the CNB did not lead to higher implied volatility. The coefficient on (both contemporaneous and cumulative) intervention is actually negative, suggesting that intervention is associated with lower volatility. However, this effect is not statistically significant. This result indicates that, in general, intervention was not followed by a significant rise in market uncertainty. This finding is consistent with several studies on G3 exchange rates based on both GARCH measures of volatility (Connolly and Taylor (1994) and Baillie and Humpage (1992)) and implied volatility (Bonser-Neal and Tanner (1996), Dominguez (1998), Murray et al (1997) and Galati et al (2005)).³¹ Finally, intervention, on average, had a statistically significant cumulative effect on market participants' balance of weights between a stronger and a weaker koruna, as measured by the risk reversal. Taken together with the results for the spot rate, this finding suggests the CNB managed to influence the spot exchange rate since it influenced market participants' balance of weights.

In summary, the empirical analysis highlights several important results. First, consistent with the general consensus that exchange rates are difficult to explain, changes in the spot rate, implied volatility and risk reversals in the Czech Republic are not easily explainable by either macroeconomic variables or central bank intervention activity. There was some, albeit weak, evidence that over the period September 2001 to October 2002, intervention on its own had statistically significant effects that lasted for at least one week. However, the small size of the regression coefficients suggests that this effect was rather limited in economic terms. These results are consistent with Holub's (2004) informal assessment of the Czech case. In line with Barabás (2003), the impact of intervention appears to be asymmetric with efforts to resist an appreciation rather than a depreciation of the domestic currency being more likely to have an impact. Finally, given that much of the intervention conducted by the CNB was openly announced, the results are also in line with the findings, more broadly, of Dominguez and Frankel (1993) and other studies concluding that intervention in industrial countries, particularly when officially announced, had a statistically significant impact on exchange rates during the 1980s.

One interpretation is that intervention conducted by the CNB was large relative to the size of the koruna/euro market, and hence the portfolio channel is more likely to have been effective. The findings are also consistent with the view that the microstructure channel might be stronger in emerging market countries. Another interpretation is that the empirical studies that found a significant impact of intervention on the exchange rate typically looked at periods over which monetary authorities made credible statements about undertaking decisive policy action to influence the exchange rate. In industrial countries, the Plaza and Louvre agreements are examples of such statements, which tended to reinforce the effect of intervention. By contrast, there is less evidence of a significant impact of intervention in studies that focus on periods in which monetary authorities refrained from making such statements.

³¹ As noted in the literature review, the impact on implied volatility is found to be sample-dependent (Bonser-Neal and Tanner (1996) and Dominguez (1998)) or strategy-dependent (Murray et al (1997)).

5. Conclusion

Empirical studies on the effectiveness of intervention in emerging market countries are plagued by severe data limitations and frequent structural breaks. As such, much of the assessment must be complemented by evidence from advanced countries. In making this assessment, one would expect a priori that foreign exchange intervention in emerging market countries might be more effective because i) the size of intervention relative to market turnover tends to be larger, ii) the existence of some form of capital controls limiting access to international capital markets gives central banks in these countries greater leverage in the market, and iii) the lower level of sophistication of the domestic market along with stringent reporting requirements may endow central banks with a greater informational advantage not only with respect to fundamentals but also aggregate order flows and net open positions of major traders.

Overall, combining the available evidence for emerging market countries with that from advanced economies, the tentative conclusion points towards the existence of a high-frequency - ranging from intradaily to a few days - connection between foreign exchange market intervention and both the level and volatility of exchange rates. There does not appear to be a reliable connection between official transactions and fundamental determinants of exchange rates that would allow central banks to determine exchange rates independently of monetary policy for sustained periods. Instead, studies suggest that intervention can sometimes affect exchange rates temporarily in a manner that depends on market conditions and the firmness of agents' expectations.

This conclusion may appear somewhat contradictory to the perception that emerging market countries in Asia have been quite successful during the last few years in their intervention operations to resist, or at least make more gradual, the trend appreciation of their currencies with respect to the US dollar. However, our empirical results suggest two possible ways for monetary authorities to influence the exchange rate for longer periods through intervention. One would be to intervene for longer periods. Our results suggest that the effect of continued intervention activity accumulates in some way, although the mechanism is not identified. The fact that central banks in these Asian countries have accumulated large foreign reserves as a by-product of their intervention efforts can be viewed as consistent with this interpretation. The other would be through incomplete sterilisation. Rapid credit growth in Asian economies where large foreign reserves have been accumulated could also be viewed as consistent with this interpretation.

From a policy perspective, the empirical results suggest that intervention may be useful in addressing undesired short-run exchange rate fluctuations stemming from temporary shocks but cannot substitute for monetary (or fiscal) policy in dealing with underlying fundamental inconsistencies in macro policy that may arise from time to time. Indeed, protracted one-sided interventions are often a reflection of an inconsistency between the desired path of exchange rates and underlying fundamentals, including the monetary policy stance. That said, in times of uncertainty when fundamentals do not point towards a clear direction for the exchange rate, monetary authorities may have an influential role in swaying market participants one way or the other. The extent to which intervention can serve a useful purpose in this regard depends on the institutional and policy credibility of the central bank. In addition, the method and strategy by which intervention is conducted can also sometimes make a difference at the margin, and should thus be formulated based on the particular objective of intervention to maximise the impact.

The empirical exercise conducted in this paper using official data on intervention carried out by the CNB during 2001-02 and option market data indicate that intervention had some (weakly) statistically significant impact on the spot rate and the risk reversal. However, this impact was small, and there was no evidence that intervention had an influence on short-term exchange rate volatility.

The results are consistent with the view that the portfolio and microstructure channels are more likely to have been effective in emerging market economies than in industrial countries, and also that efforts to resist an appreciation rather than a depreciation of the domestic currency are more likely to have an impact. Finally, the findings are consistent with the literature that concludes that intervention is more likely to be effective in periods during which monetary authorities make credible statements about undertaking decisive policy action to influence the exchange rate.

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Foreign exchange intervention in Argentina: motives, techniques and implications

Claudio Irigoyen

1. Introduction

Finding the optimal degree of exchange rate flexibility is difficult. To a great extent this is because the optimal degree of exchange rate flexibility is quite idiosyncratic and depends on a number of country-specific characteristics that might include the degree of openness, the degree of price and wage stickiness, the degree of short- and medium-term exchange rate pass-through to prices, the degree of substitutability between domestic and imported goods, the state of the banking system and the amount and nature of financial dollarisation.

Argentina's monetary and exchange rate policy is currently in a state of transition to an inflation targeting approach from the very particular mix of policies that helped to manage the severe crises of 2001 and 2002. After the devaluation, it was necessary to anchor expectations that were, in some circles, running wild, so much so that some commentators were predicting a hyperinflation. Continuing capital outflows had to be stemmed by the use of severe, albeit transitory, capital controls. In addition, the central bank had lost the monopoly of issuing money and 15 provinces were issuing their own quasi-monies that circulated abundantly within (and, in a couple of cases, beyond) their borders. The technique of projecting bands for the path of the broad monetary base (which includes the quasi-monies) proved to be an effective way of coping with adverse expectations. Foreign exchange sales were used initially to stem the possibility of an even greater real exchange rate overshooting than that which occurred.

One of the distinguishing features of the post-crisis period has been the low degree of exchange rate pass-through to domestic prices experienced after the very substantial nominal depreciation of the peso. Both a very negative initial output gap and sound monetary policies have been responsible for the low degree of inflationary pressures.

Since the initial post-crisis phase, the quasi-monies have been eliminated, capital controls have been almost completely eradicated, private capital outflows have stopped and the economy has been recovering briskly. Consequently, the central bank has introduced a number of changes in its policies and procedures, including foreign exchange market intervention and sterilisation policies, as well as an international reserves accumulation policy, always within the constraints imposed by the central bank's essential mission, which is fighting inflation. These changes are presented below.

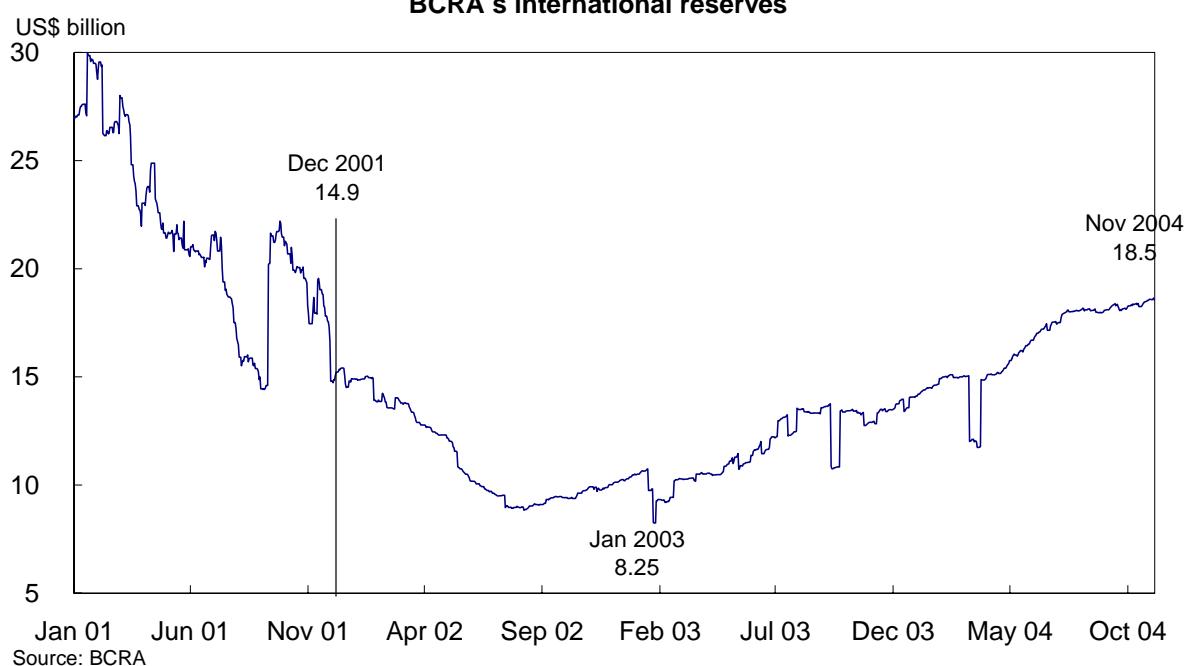
2. Motives

The reasons for and methods of the central bank (BCRA) interventions in the foreign exchange market have changed substantially over the last five years. Up to December 2001, Argentina used a currency board system and the role of the central bank was to exchange, without restriction, pesos and US dollars for each other, one to one. With a run on the banking system, the chaotic ending of the currency board and the default on a part of the government's foreign currency-denominated debt, the central bank faced a number of problems. First, it needed to control foreign exchange outflow and the exchange rate overshooting. During 2001, honouring the currency board programme meant that international reserves had declined from US\$ 34.5 billion to US\$ 19.7 billion for the system as a whole, and from US\$ 27 billion to US\$ 19.4 billion for the BCRA. The central bank's international reserves reached a low of US\$ 8.25 billion in January 2003. The government first restricted deposit withdrawals from the banking system and later decreed the forced conversion of US dollar-denominated deposits in the banking system into pesos at an exchange rate substantially lower than that prevailing in the market. Beginning in early 2002, restrictions were imposed on capital outflows. Limits were placed on the amounts of monthly exchange transactions allowed per person (which generated a secondary

demand for individuals to use their identity number for transactions for others) and traditional exporters were required to convert their earnings into pesos through the central bank.

Beginning in May 2002, in a bid to forestall the increasing dollarisation of the economy, the central bank started issuing its own debt instrument (Central Bank Notes) as a means of providing the domestic financial market with a peso-denominated asset that could be an alternative to the US dollar and dollar-denominated securities. These notes initially had a maturity of one week, but as the instrument gradually evolved into a tool of domestic liquidity management, maturities have increased and now range from one month to three years.¹ Annual interest rates on these securities rose to a peak of around 120% in pesos (in the middle of 2002) and have fallen gradually over the past three years so that they are now in the 3 to 7% range. During this time, the restrictions on private purchases of foreign exchange have been gradually relaxed and most of the restrictions that remain involve reporting and are not quantity restrictions. The BCRA has intervened in the exchange market regularly in order to reduce the volatility of the exchange rate and to replenish the central bank's international reserves while monetising a rapidly growing economy according to the monetary programme.

Figure 1
BCRA's international reserves



Since January 2003, the BCRA has accumulated international reserves equal to US\$ 10.3 billion, mostly in dollars, through regular interventions in the local market so that as of 4 November 2004, gross international reserves reached US\$ 18.5 billion. The rebuilding of the stock of international reserves was the welcome corollary of a very successful monetisation strategy. The strategy consists of monetising the economy (growing at an average rate of 8%) through the most liquid market available, that is the foreign exchange market, given that the other sources of variation of money supply are actually acting as sources of contraction. The three exogenous sources of contraction of money supply are: the financial system, by paying back the loans granted by the central bank as lender of last resort during the crises; the government, applying a fraction of the fiscal surplus to payments to International Financial Institutions (IFIs); and the BCRA itself, through the issuance of Central Bank Notes in order to establish a reference rate for the money market. It is the policy of the central bank to accumulate an adequate cushion of international reserves, which plays a critical role in granting needed flexibility throughout the government debt restructuring process, during which there are substantial debt amortisations with the IFIs. Although Argentina has introduced a great deal of

¹ Letras del Banco Central (LEBAC) are notes with maturities shorter than one year, and Notas del Banco Central (NOBAC) have maturities longer than a year. LEBACs are issued in pesos, pesos indexed by CER and in US dollars. NOBACs are issued in pesos and pesos adjusted by CER.

exchange rate flexibility, a substantial cushion of reserves is viewed as providing protection against a number of shocks, including changes in capital flows (sudden stops), changes in international market conditions for Argentina's exports and imports, and for managing shocks that could come be related to problems with foreign exchange denominated debt (both public and private).

The optimal composition and investment strategy of international reserves is currently under study. Recently, the amount of reserves held as gold has been increased to serve as insurance against catastrophic international events (of which there is a small probability), and as part of an investment strategy.

A number of times over the last few years, foreign exchange reserves have been lent to the central government to cover short term timing mismatches in the payments required by international financial agencies (such as the IMF) and later disbursements to Argentina by these same agencies or other payments by the central government.

3. Governance, accounting, relations with the government and communication

Argentina's international reserves belong to the central bank and their evolution is reflected in the balance sheet of this institution. In addition, the central bank determines the composition of international reserves, both in terms of the money in which it is held and the investment policy. Recently, reserves investment policy has aimed to maintain high levels of liquidity while at the same time minimising the potential effects of price changes. Argentina is currently negotiating the restructuring of its defaulted sovereign debt, and reserve investment policies could change once this is completed.

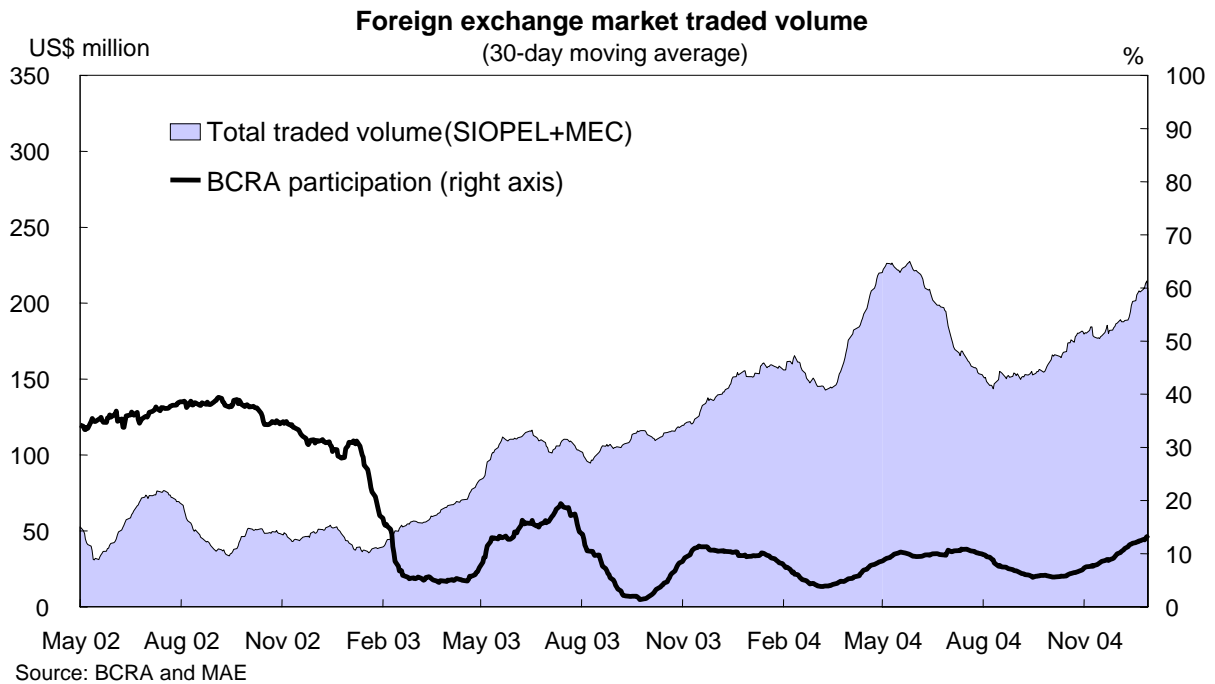
The central bank has full legal powers for taking decisions on interventions in the foreign exchange market. Intervention and sterilisation operations are jointly designed to meet quantitative targets of the monetary programme, as described in the section above. Daily intervention decisions are made by the central bank's president after consulting with the bank's technical staff, in a manner consistent with the current monetary programme. Interventions take place in the (wholesale) spot market, which is by far the most developed and liquid in Argentina. The costs of intervention are borne by the central bank (to whom profits accrue). Changes in valuation are shown in the balances under "International Reserves" with the impact in the item "Net Equity - Net Income". International reserves are reported on a gross basis for domestic purposes, but are reported to international financial agencies as net of outstanding debt to the IMF, as agreed upon. Profits or losses from operations in international reserves are reflected in the item, "Difference in Market Price of Gold, Currency and Government Securities - Income (Loss)".

There is no policy of official announcement of changes in intervention strategy and the quarterly Inflation Report describes intervention actions during the quarter it surveys. The amounts of realised interventions are announced weekly through press communications that are also published on the central bank's web page.

4. Techniques and tactics

The central bank's foreign exchange transactions take place during normal business hours via direct trading in the wholesale spot market. The results of these transactions are published via a daily press release which states that an intervention has occurred and gives information about its size. These daily press releases are summarised in the regular weekly Exchange Report, which comes out with a minimum lag and describes the dates and size of interventions. This policy of quickly providing full ex-post information to the market contrasts with the practices of most central banks, which tend to tactically use secrecy in their foreign exchange interventions. However, Argentina has a long history of monetary instability, and the BCRA needs to build and maintain its reputation as the manager of an independent monetary policy not bound by the straitjacket of a currency board. In that context, this transparency policy has been useful by allowing continuous market supervision over the central bank's progress in the implementation of the monetary programme.

Figure 2:



The foreign exchange market in which the BCRA operates has been growing steadily during the past two years. With the controls imposed just after the crisis, exporters were obliged to surrender their US dollars to the central bank so that the BCRA was initially always selling dollars. When the exchange rate overshooting relaxed, the Central Bank began purchasing dollars and its interventions were often as much as 50% of the market. Both the relative and absolute size of interventions have declined and interventions now account for approximately 7% of the market.

5. External Aspects

Since the end of the currency board regime in the beginning of 2002, the central bank has intervened regularly in the exchange market with the objective of stabilising the exchange rate and reducing its volatility while monetising a growing economy. Intervention has been regular and quite predictable, with the central bank intervening on approximately 90% of the days that the market has been open. As a result, intervention has had both a short term and a sustained effect on volatility and monetisation. The sustained effect has been achieved by the continuous process of interventions, which is also needed to compensate for the monetary base contraction caused by the government and banking sector transactions, as already discussed. Almost all interventions in the last two years have been central bank purchases of foreign currency, whereas most interventions during the first half of 2002 were sales.

With the crisis at the beginning of 2002, exchange rate interventions were accompanied by an increasing array of exchange controls, regulations and information requirements. In addition, exporters faced surrender requirements with the central bank. As mentioned above, these restrictions have been gradually reduced and currently are not really binding.

Dollarisation does not now present much of a problem in terms of exchange rate interventions because the forced pesoisation of much of the financial system after the devaluation in 2002 has left the financial system with a very low level of dollarisation. The relatively high current level of reserves has an expectations effect since they permit the central bank to respond in a positive and controlled manner to sudden reversals of capital flows. This high level of reserves has resulted in an increased credit rating from a major rating agency.

6. The domestic implications

The interventions of the central bank since the middle of 2002 have allowed it to provide the Argentine economy with an adequate level of liquidity and to meet the quantity targets of the monetary programme while keeping the inflation rate within its forecast band. Additionally, these operations have permitted the central bank to control excessive volatility in the exchange rate that might have been harmful to economic activity.

Argentina entered in partial default on its sovereign debt in 2002 and, due to the magnitude and complexity of the operation, is still negotiating the restructuring of this debt. As already mentioned, initially the central bank had no instrument for intervention in the monetary market. For this reason, it began issuing its own instruments, (the Central Bank Notes described above). These instruments were rapidly accepted by the financial community and their interest rates serve as a reference rate for the system. Recently, the Central Bank has begun to trade in the inter-bank repo market with seven day instruments backed by LEBACs and has been using this to influence the short-term interest rate. The fact that these Central Bank Notes are of various maturities has provided the financial system with a reference yield curve, facilitating the reconstruction of longer-term private lending.

Even though there is much to be done, the experience acquired by the central bank during the years that followed the crisis was proved to be very useful for conducting monetary policy under a floating exchange rate regime in an emerging economy. We expect to continue improving our communication strategy to appear as transparent as possible to the markets in order to continue building up the stock of credibility that every central bank needs to conduct monetary policy in a successful way.

Provision of FX hedge by the public sector: the Brazilian experience

Afonso Bevilaqua¹ and Rodrigo Azevedo²

Introduction

A singular experience with forex intervention in Brazil over the past ten years has been the use of foreign exchange linked debt instruments denominated in domestic currency. The country started to use them with the goal of safeguarding the administered FX regime in 1994-98. Later, those instruments were useful to smooth the transition to the floating rate regime in 1999, and to mitigate the impact on the economy of two further major devaluation waves in 2001 and 2002. While such a strategy was successful in avoiding generalised financial distress or a credit crunch in the private sector during that period, the accumulation of a large stock of such instruments increased the vulnerability of the public sector balance sheet to adverse external shocks. As a result, the main impact of the three large devaluations was felt in the public sector's debt.

In 2003-04, the rapid improvement in fundamentals enabled the Central Bank to pursue a strategy of actively reducing the public sector's foreign currency exposure. In this period, the reduction in FX hedge provision by the public sector reached US\$ 35.1 billion, or 53.8%. The share of US\$-linked instruments in the domestic public debt was reduced from a peak of 40.7% in September 2002 to 9.9% in December 2004. As a result, there was also a significant reduction in the sensitivity of the total public debt to any 1% permanent devaluation, from 0.34 percentage points of GDP in September 2002 to 0.11 percentage points in December 2004. The programme has been successful in enhancing the resilience of the public debt to shocks that affect the exchange rate, thus being one of the key factors behind the recent enhancement of Brazil's creditworthiness. The programme is still in place, and further progress continues to be made in retiring the outstanding stock of such instruments.

Background

Despite chronically high inflation observed between the 1980s and 1994, the Brazilian economy has never dollarised. In order to mitigate inflationary losses, Brazil did not use the dollar as unit of account or means of payment, as many other economies have done in similar circumstances, developing instead broad, sophisticated and credible indexation mechanisms. These instruments enabled the preservation of the demand for domestic debt.

1994-98: building up external liabilities

As a complement to the monetary reform implemented in 1994 (the so called Real Plan), Brazil adopted an exchange-rate anchor which was successful in stopping high inflation and stabilising it at low levels. The lack of long-term sources of financing in domestic currency, the high real interest rates needed to stabilise inflation and the low FX volatility provided the appropriate incentive for the private sector to resort to external financing. As a result the external debt of the private sector increased by 211% between 1994 and 1998, reaching US\$ 129.1 billion or 16.4% of GDP by end 1998.

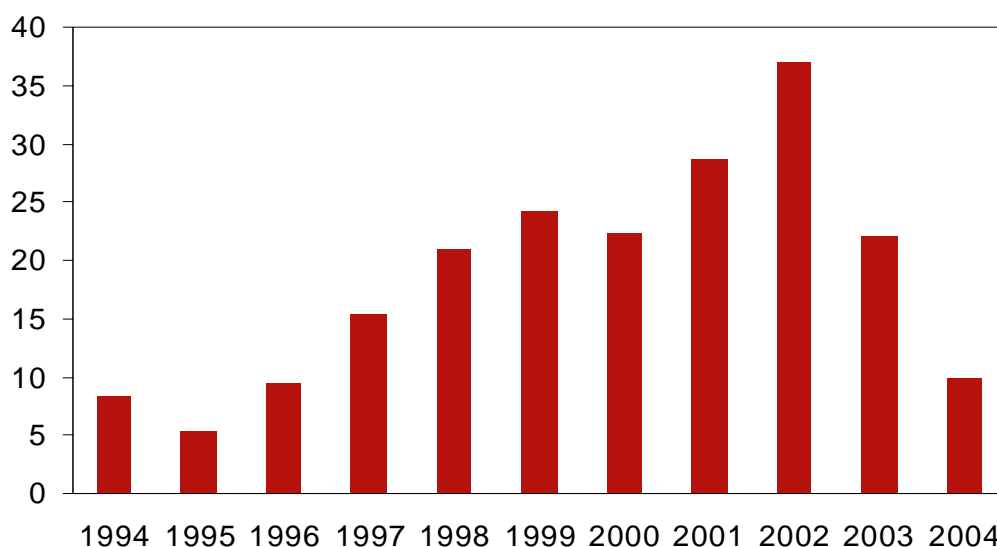
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With large current account imbalances, and any surplus in the balance of payments being used to shore up international reserves, there was no natural supplier of foreign exchange in the economy. Thus, the government had to step in and provide a foreign currency hedge to the local agents as a way to reduce potential balance sheet currency mismatches in the private sector and at the same time safeguard the administered FX regime. The instruments of choice were US\$-linked Treasury notes (NTN-D), denominated and payable in domestic currency, which were then perceived as offering relatively cheap financing to the Treasury. At later stages in that period, the Central Bank also resorted to the issue of notes (NBC-E) and the use of derivative instruments at the local futures exchange BM&F.

In 1997 and 1998, external crises in Southeast Asia and Russia increased the vulnerability of the Brazilian economy, leading to significant losses of international reserves and undermining the sustainability of the currency peg. The Central Bank intensified the sale of foreign exchange linked securities and by December 1998, the outstanding stock of those instruments had reached 20.9% of the domestic public debt, vs 15.4% in December 1997 and 9.4% in December 1996 (Figure 1).

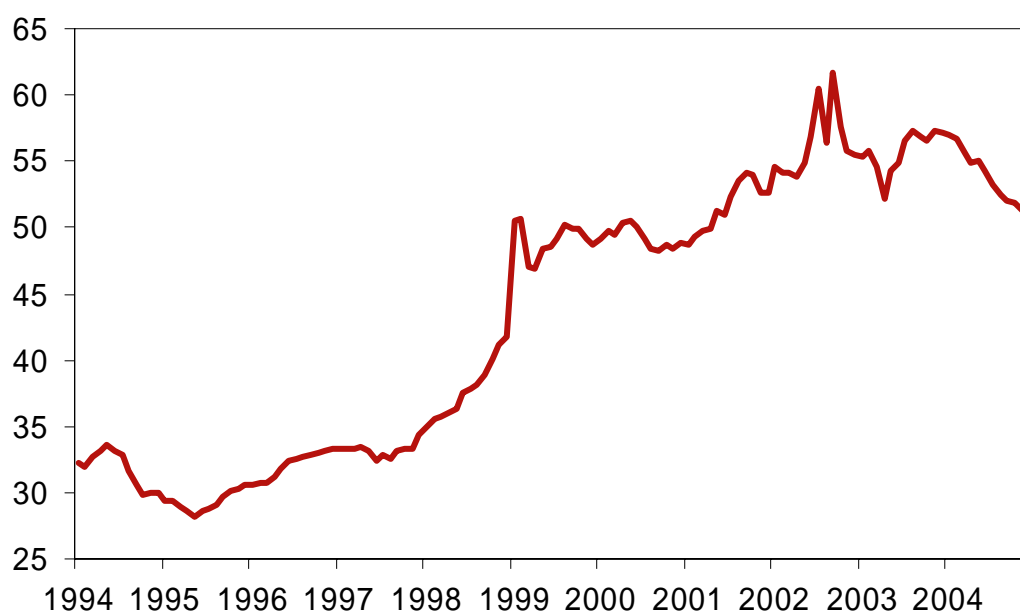
Figure 1
**US\$-linked domestic debt/
 total domestic debt (1994-2004)**
 %



Source: Banco Central do Brasil.

In spite of such a build up in foreign currency liabilities, currency movements explain only a minor part (2.1 percentage points) of the 11.7 percentage point increase in the net public debt/GDP ratio between 1995 and 1998 (Figure 2 and Table 1). On the one hand, the country was still following an administered FX regime; on the other, typical debt dynamics was negatively affected by a policy mix that combined lax fiscal policy and high real interest rates.

Figure 2
Debt/GDP ratio (1994-2004)
% of GDP



Source: Banco Central do Brasil.

Table 1
Net public sector debt increase (1995-98)

Decomposition as % of GDP

	1995	1996	1997	1998	1995-98
Net debt increase	0.5	2.7	1.1	7.4	11.7
1. Primary surplus	-0.3	0.1	0.8	0.0	0.7
2. Interest on the debt	5.9	5.4	4.8	7.4	21.2
3. Depreciation on domestic debt	0.1	0.1	0.2	0.5	0.8
4. Depreciation on foreign debt	0.8	0.1	0.3	0.3	1.2
5. Skeletons	1.5	2.0	0.1	1.6	4.5
6. Privatisation proceeds	0.0	-0.2	-1.8	-1.4	-3.3
7. Effect of GDP growth	-7.6	-4.8	-3.3	-1.0	-13.5
Debt dynamics (1+2+7)	-2.0	0.7	2.4	6.4	
Currency (3+4)	1.0	0.2	0.5	0.7	
Net "skeletons" (5-6)	1.5	1.8	-1.7	0.2	

Source: Banco Central do Brasil.

1999-2002: after floating, coping with three waves of devaluation

The FX regime changed into floating in January 1999, with a major devaluation wave in the first quarter of 1999. The Brazilian Real depreciated by 30.3% between December 1998 and March 1999 (Figure 3). While the prior provision of US\$-linked securities was not enough to prevent the collapse of the peg, the outstanding stock of those instruments helped to prevent significant balance sheet mismatches in the private sector. As a result, the instruments served as a mechanism to smooth the transition from the administered to the floating FX regime, without creating any generalised financial distress or a credit crunch.

Figure 3
Exchange rate R\$/US\$ (1994-2004)
R\$/US\$



Source: Banco Central do Brasil.

To a large degree, this explains why, contrary to the experience of most emerging economies whose currency peg collapsed in the late 1990s, the Brazilian economy actually posted a 0.8% *positive* GDP growth in 1999. The cost, however, was felt in the debt/GDP ratio, which increased by 7.0 percentage points to 48.7% of GDP in 1999. The currency depreciation was responsible for 6.6 percentage points of that total, as the fiscal stance had been tightened, mitigating the pressure coming from “pure debt dynamics” factors (Table 2).

After 1999, Brazil underwent two further major devaluation waves. In 2001, the country faced external shocks from two main different sources: financial contagion associated with the run up to the Argentine debt crisis in December and the risk aversion that ensued following the events of 11 September 2001 in the US. These shocks led to an increased demand for hedging by the private sector. Given a large current account imbalance (−4.6% of GDP in 2001) and an environment of increased risk aversion in global financial markets, there continued to be no natural provider of foreign currency hedging in the economy.

In this context, the demand for foreign currency led to substantial pressures against the Brazilian Real, which depreciated 27.8% between January 2001 and October (peak devaluation) that year. One of the Central Bank’s responses was to provide a hedge through net placements of US\$-linked securities so as to mitigate the impact of the increased demand for hedging on the foreign exchange market. As the cause of the shocks was perceived as being “purely external” to the country, the rollover rate for US\$-linked securities increased, reaching 167.2% that year (Figure 4), or 133.7% when considering the rollover of accrued intermediate and final interest paid to debt holders.

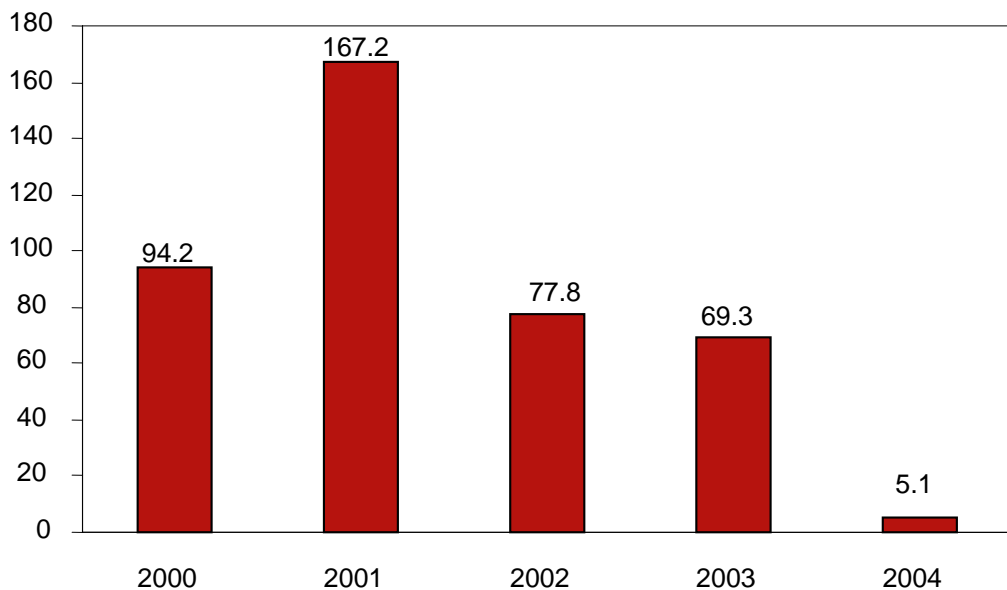
Table 2
Net public sector debt increase (1999-2004)
 Decomposition as % of GDP

	1999	2000	2001	2002	2003	2004	1999-2004
Net debt increase	7.0	0.1	3.9	2.9	1.7	-5.4	10.1
1. Primary surplus	-2.9	-3.3	-3.5	-3.3	-4.1	-4.4	-16.9
2. Interest on the debt	8.2	6.8	6.9	7.2	9.1	6.9	34.6
3. Depreciation on domestic debt	3.8	0.8	1.5	4.8	-1.4	-0.2	6.5
4. Depreciation on foreign debt	2.8	0.8	1.5	4.4	-1.6	-0.3	5.3
5. Skeletons	1.3	0.8	1.5	0.9	0.0	0.4	3.4
6. Privatisation proceeds	-0.8	-1.8	-0.1	-0.2	0.0	0.0	-1.9
7. Effect of GDP growth	-5.3	-3.9	-3.9	-11.0	-0.3	-7.8	-20.8
Debt dynamics (1+2+7)	-0.0	-0.4	-0.5	-7.1	4.7	-5.3	
Currency (3+4)	6.6	1.6	3.0	9.3	-3.0	-0.5	
Net "skeletons" (5-6)	0.5	-1.0	1.4	0.7	0.0	0.4	

Source: Banco Central do Brasil.

The stock of those instruments increased that year by 32.3%, or US\$ 18.8 billion, to US\$ 77.0 billion. Again, the provision of a hedge mitigated the impact of the large currency volatility on the private sector balance sheet and the economy still managed to grow 1.3% that year. But the share of US\$-linked instruments in the domestic public sector debt increased from 22.7% in 2000 to 28.6% in 2001, and net debt increased by 3.9 percentage points to 52.6% of GDP. The impact of currency movements was responsible for 3.0 percentage points of that total.

Figure 4
FX instruments rollover rate¹ (2000-04)
 %



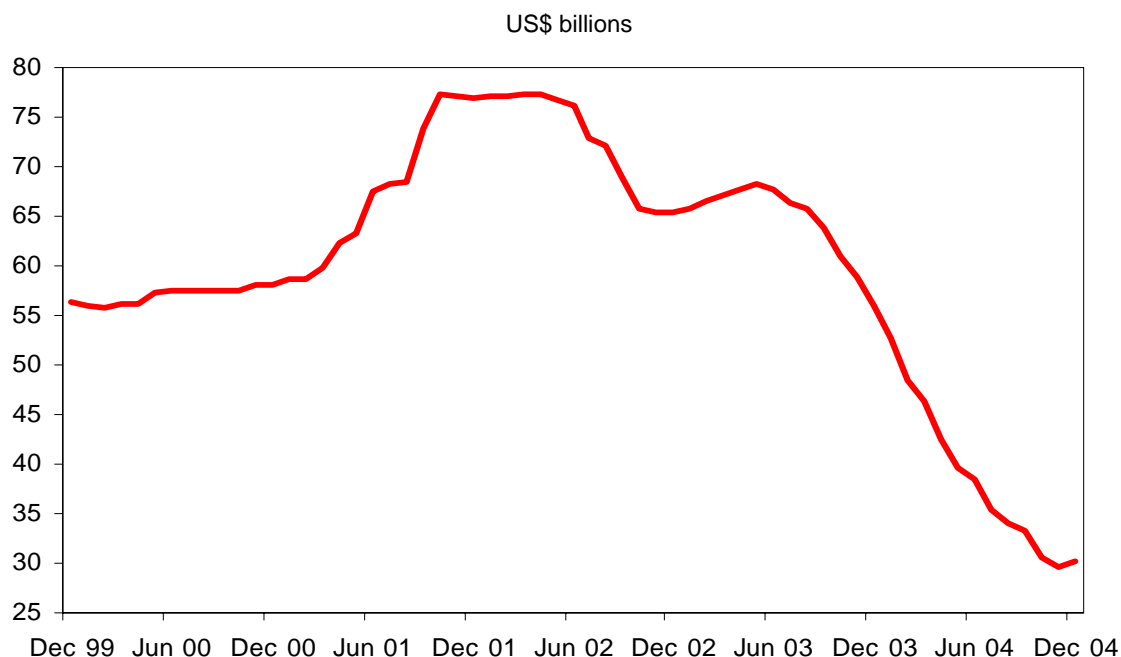
¹ Only considers rollover of principal, ie excludes rollover of intermediary and final interests.
 Source: Banco Central do Brasil.

In 2002, before a new wave of large devaluation, the Central Bank re-introduced the use of FX derivatives, which had not been used since the pre-floating period, and started to replace Treasury US\$-linked notes (NTN-D) with FX swaps. At this point, the Central Bank had already interrupted the issuance of NBC-E (US\$-linked notes issued by the Central Bank), following the determination of the Fiscal Responsibility Law approved in May 2000 - the law prevented the Central Bank from issuing securities of any kind. The new FX swaps contracts were perceived as having lower credit risk than the NTN-Ds, as they were traded and settled at the BM&F (the local futures exchange) and offered daily margin adjustments. In those FX swaps, the Central Bank pays US\$ variation plus local onshore US\$ interest rates, and receives in exchange the cumulative one day interest rate on interbank certificates of deposit (the so called CDI rate) over the period of the contract. It effectively works as a FX hedge for takers of the swap.

Later that year, the country had to cope with another round of large currency devaluation. This time around, the nature of the adverse shocks led to an important confidence crisis, based on two main elements: (1) an external factor, amid an environment of increased risk aversion on global capital markets in the aftermath of the Enron scandal, and, in Latin America, with the Argentine debt default in late 2001; and (2) a domestic factor: the concerns over public debt solvency, in light of uncertainties caused by the presidential elections in the second half of 2002.

The combined effect was a sudden stop in external financing (FDI, long-term loans and short-term capital inflows), which totalled US\$ 28 billion (roughly 6% of GDP) in the year. The result was once again large depreciation pressures and the Brazilian Real lost 40.3% of its value against the US dollar between May and 22 October, the peak devaluation that year. This time around, though, the "lack of confidence" element caused a different response by economic agents and the period was marked by a reduction in the demand for onshore hedging and a reduction in external FX liabilities of the private sector. The increased perception of credit risk carried by public debt in general and by US\$-linked securities in particular caused their rollover rate to fall to 50.1% of the maturing principal during August-October, averaging only 77.8% for the year (or 67.1%, if intermediary and final interest accrued are considered). As a result, the total outstanding stock of US\$-linked securities was reduced by US\$ 11.7 billion that year (Figure 5). Even so, given the previous large exposure of the public sector to FX risk, the net public sector debt/GDP ratio increased by 2.9 percentage points that year, of which currency movements pressured up 9.3 percentage points, being partially offset by a 7.1 percentage points negative pressure exerted by "pure debt dynamics" elements (nominal GDP growth, primary fiscal surplus and pure interest on debt).

Figure 5
Total outstanding FX domestic debt (1999-2004)



Source: Banco Central do Brasil.

2003-04: rolling back FX hedge and reducing public sector FX exposure

After a volatile period since 1997, the year 2003 was marked by a rapid improvement in fundamentals. The new administration elected in October 2002 signalled very early on its commitment to a consistent policy mix, thus allaying public debt solvency fears. On the fiscal side, the multi-year targets for primary surpluses were increased and structural reforms of the social security and tax systems were announced, thus signalling the commitment to a long-term fiscal adjustment that should lead to a falling path for the public debt/GDP ratio. On the monetary side, interest rates were increased and the de facto autonomy of the Central Bank was reaffirmed, paving the way to the resumption of a downward trend for inflation. In the external sector, a weak currency and increasing global demand triggered a large response of the trade account, and the country saw the first current account surplus since 1992. In addition to the strong policy signals, easing global financing conditions helped to restore and normalise the country's access to international capital markets. The result was a substantial reduction in the country risk premium and a substantial appreciation of the Brazilian Real after March 2003.

This favourable environment enabled the Central Bank to actively seek to reduce the public sector's FX exposure. From late 2001 to December 2002, the Central Bank approach had been to roll over 100% of the principal coming due for all NTN-Ds and swaps maturing. In January 2003, the policy of not rolling over coupons and final interest payments on maturing US\$-linked securities was extended to maturing FX swap contracts. As a consequence, the BCB started to discount 6% (equivalent to the six-month coupon of the NTN-D) from the swaps maturing notional value per semester. In May 2003, the Central Bank announced a new rollover procedure for US\$-linked securities by which it would no longer offer necessarily 100% of those securities at each maturity, opening up the possibility of net amortisation of securities at each maturity. The stated goal was to gradually reduce the outstanding amount of US\$-linked securities over the medium term, and thus to reduce the public sector debt sensitivity to FX movements.

While the measure had positive feedback, the debate among local FX market players was centred on the potential noise and pressure to the exchange rate caused by the lack of an explicit ratio for rollovers. The first set of auctions were marked by intense speculation on what the new rollover rate would be, with market agents believing in figures between 80 and 95%. The actual discretion in not fixing an explicit rollover rate was important as a more positive than expected global environment led to lower currency volatility and to a reduction in FX liabilities of the private sector. This environment enabled a much faster than expected reduction in the rollover rate over the following months, and an acceleration of the retirement of those securities. The rollover rate of FX instruments was reduced to 41.6% of the principal maturing in the June/December period, without any major effect on the FX market, and the average rollover rate in 2003 totalled only 69.3% (61.3% considering intermediary and final coupons). In the year, the programme managed to retire the equivalent of US\$ 9.4 billion in US\$-linked domestic debt.

Also, on the operational side, the Central Bank had disciplined auction procedures in July, establishing a maximum of two auctions to be carried out for each rollover. Before that, the Central Bank had never established any specific rollover procedure. Several auctions could occur in the same day and there was no routine regarding when to start a certain rollover. In September, the number of auctions was cut to one, to be preceded by a survey among FX dealers and large corporations on their demand for FX hedging.

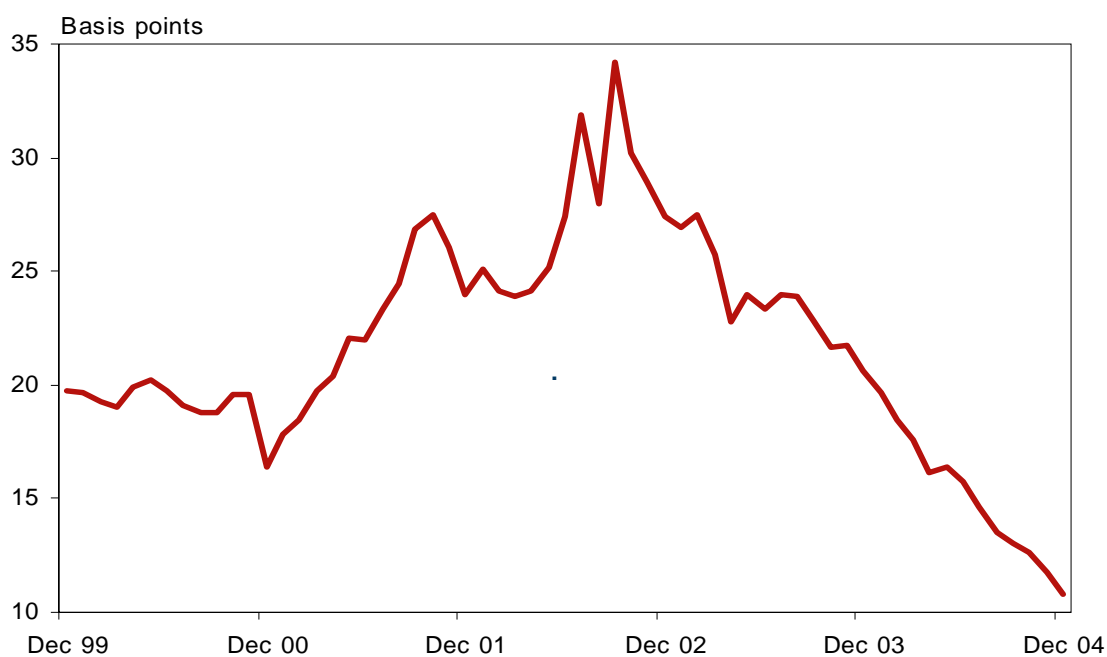
In 2004, despite an increase in FX volatility and global risk aversion associated with the perspective of an early start for the tightening cycle in the US, the programme of retirement of US\$-linked securities continued and the Central Bank did not offer any securities between January and May (zero rollover rate). The rapid FX depreciation in April-May was interpreted by local FX market players as an increase in the demand for FX hedging, leading to speculation on whether the Central Bank would go back into a policy of net placements of US\$-linked securities. Instead, the Central Bank reaffirmed its goal of retiring FX linked securities over time. The rollover rate was in fact increased, but only to 33.2% in June, to 18.6% in July and to 18.4% in August, only to resume a zero rollover rate from September onwards. As a result, the average rollover rate in 2004 was reduced to only 5.1%, and the FX component of domestic debt was nearly halved, cut by the equivalent of US\$ 26.2 billion.

Consolidated results

Since 2003, the Central Bank strategy of actively reducing the public sector's foreign currency exposure has importantly strengthened Brazil's public debt resilience against shocks that affect the exchange rate, thus being one of the key factors behind the enhancement of Brazil's creditworthiness. Over the past two years, the reduction in FX hedge provision by the public sector reached US\$ 35.1 billion, or 53.8%. The share of US\$-linked instruments in the domestic public debt was reduced from a peak of 40.7% in September 2002 to 9.9% in December 2004. As a result, there was also a significant reduction in the sensitivity of the total public debt (domestic plus external) to any 1% permanent devaluation, from 0.34 percentage points of GDP in September 2002 to 0.11 percentage points at the end of 2004 (Figure 6). The programme is still in place, and further progress continues to be made in retiring the outstanding stock of such instruments.

Figure 6

Impact of 1% devaluation of exchange rate variation in the net debt/GDP ratio (1999-2004)



Flexible exchange rate regime and forex intervention

José De Gregorio and Andrea Tokman R

Introduction

This paper reviews the recent experience with a flexible exchange rate regime and forex interventions in Chile. It discusses the state of the economy and the policy implications that arise in the new regime; in particular, the reaction of the authorities to unexpected movements in the exchange rate, through monetary policy and sterilised interventions. The low risks associated with financial and price instability prevailing in Chile justify limiting policy reaction to exceptional circumstances in the exchange rate market.

A Managed exchange rate was a common feature of Chilean exchange rate policy during the 1990s and before. The move towards a flexible exchange rate at the end of the decade implied a de facto compromise away from exchange rate targeting. Macroeconomic stability, consolidated with low inflation, sound fiscal policies and a strong financial system, made the compromise credible and feasible in the eyes of the market and the authorities. However, an escape clause was kept open when flexibility was introduced. The central bank reserved the right to intervene in the foreign exchange market under exceptional circumstances, and it actually did so in two four-month episodes, in 2001 and 2002.

The purpose of this paper is to analyse exchange rate management in the Chilean economy, within the flexible exchange rate regime. First, in section 1, we briefly describe the conditions under which the flexible exchange rate regime was implemented in September 1999. In section 2 we discuss policy responses to exchange rate variations within the floating regime. We look at the rationale for intervening through interest rates and/or directly in the foreign exchange market, the strategy and instruments used and their effectiveness. In section 3 we deal explicitly with the Chilean experience with intervention. Section 4 presents the conclusions and policy implications.

1. The implementation of the free float

Following a long history of managing the exchange rate, the Central Bank of Chile decided to let the exchange rate float freely in September 1999. This was a reasonable thing to do; the coexistence of two nominal anchors – inflation and exchange rate – eroded the credibility of the inflation-targeting regime, and undermined its effectiveness. Moreover, although there were risks associated with the float, the benefits far exceeded the potential costs.

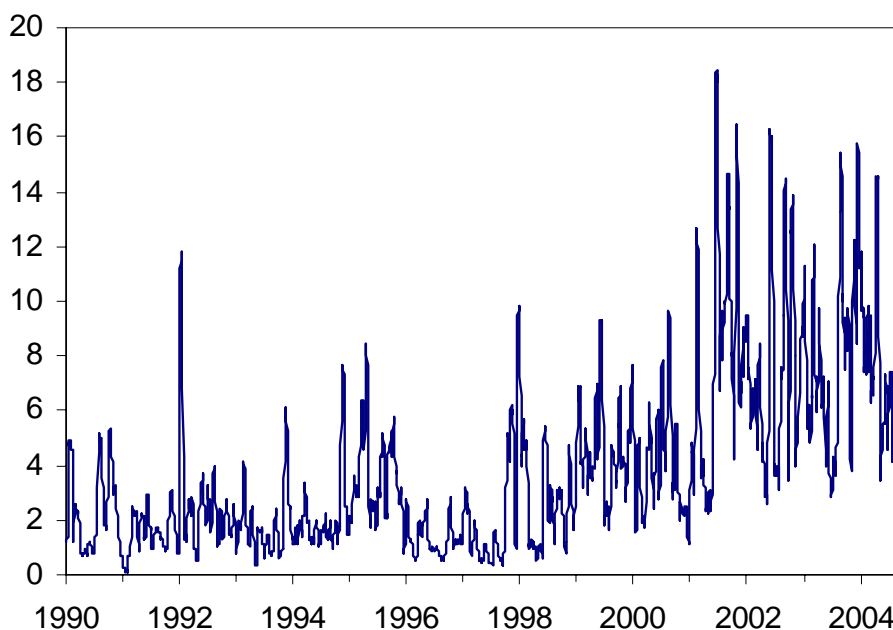
Most of the crises and recessions in Chile have been associated with some rigidity in the exchange rate. Most notably, in 1982, a fixed exchange rate, together with a bad international environment and a fragile financial system led to a recession where output fell by 13%. The next recession, in 1999, which caused a decline in output of 1%, was also linked to difficulties in adjusting the exchange rate to the deteriorated international environment and heavy pressures on the peso during 1998. This had led to a sharp tightening of monetary policy and a narrowing of the exchange rate band. The main rationale provided for the monetary tightening on the eve of the Asian crisis was the need to reduce expenditure and consequently the current account deficit, then larger than 5% of GDP, which were viewed as difficult to finance in a scenario of a sharp decline in capital flows. In addition, reasons for defending the currency were the fear that the inflationary repercussions from a sharp depreciation, and the potential balance sheet effects on the corporate sector, could contaminate the financial system, were the.

As financial turbulence passed and inflation declined to levels close to 2%, the authorities decided to implement a fully fledged inflation target, which also included increased degrees of transparency of monetary policy. Since then, the target has been to keep inflation within a range of 2 to 4% within a horizon of twelve to twenty four months. As part of this strategy, the implementation of a flexible exchange rate regime was central.

Arguments that favour flexible exchange rates are abundant in the economic literature. The most traditional ones, associated with Mundell (1961), state that flexible exchange rates are key in easing the adjustment to real shocks in the presence of price stickiness. In such case, real shocks will generate movements in the exchange rate that will produce the necessary shift in resource allocation, reducing the impact on output and employment. In contrast, a real shock that calls for a depreciation of the currency is magnified in the presence of a fixed exchange rate. The only way to achieve a more depreciated real exchange rate is through a recession that brings deflationary pressures with it.

Another conclusion arising from the Mundell-Fleming model is that with floating exchange rate regimes, domestic authorities retain the flexibility to use independent monetary policy as a stabilising tool. Thus, this preserves the possibility of conducting countercyclical monetary policies. Credibility is a key factor for its effectiveness, which can be achieved with an independent central bank, as is the case in Chile. In contrast, under a fixed exchange rate regime, monetary policy becomes subordinated to the exchange rate commitment, and fiscal policy remains the only stabilisation tool. This has proven to be a titanic task, as evidence shows that fiscal policy is highly procyclical in many countries due to poor access to financial markets (Gavin and Perotti 1997). In Chile, there is still scope for stabilisation through fiscal policy. Indeed, Chile is the only country in the region that can have countercyclical fiscal policy. The government has implemented a rule based on a cyclically adjusted budget deficit. Although the advantages of having fiscal rules and limiting discretionary fiscal policy are beyond the scope of this discussion, the disadvantages of giving up monetary policy and relying only on fiscal policy are evident.

Figure 1
Standard deviation of the nominal exchange rate
 (30 day rolling window)



Arguments against a shift towards floating exchange rate regimes are the costs associated with an unsurprising increase in exchange rate volatility (Figure 1). Still, the threat that such increase inflicts on the Chilean economy is limited. First, the relative volatility of the Chilean peso remains within normal levels by international standards (Table 1). Additionally, price and financial stability have not been affected since the exchange rate was floating. The pass-through from depreciation to domestic inflation was relatively small and has declined since the peso began floating. Regarding financial fragility, in late 1999 there was only slight liability dollarisation in the banking system, and the corporate sector was adequately hedged against exchange rate risk. Finally, the derivatives market has deepened substantially since the exchange rate was allowed to float. Thus, Chile was well

prepared to float, with little reason to fear floating.¹ In such a scenario, the flexible exchange rate system should have operated smoothly, as it has done for most of the floatation period. Nevertheless, there have been a few episodes where the central bank has reacted to movements in the exchange rate. These episodes have been extremely rare and constrained enough as to keep Chile within the limited group of countries that are qualified as both de facto and de jure floaters in all international classifications (see, for example, IMF or Levy-Yeyati and Sturzenegger, 2004).

2. Policy response to exchange rate fluctuations: an overview

Policy responses

The Central Bank of Chile, like most central banks around the world, has responded to exchange rate fluctuations in several ways during the past years: first, during the 1990s, with capital controls and reserve accumulation; then, during the Asian crisis, with a combination of monetary and intervention policies. Finally, after the exchange rate was allowed to float, there have been two periods of sterilised intervention, when the currency was under extreme stress and the monetary authority believed that it was becoming misaligned and the market was overreacting. As such, these reactions have been rare and not automatic.

Table 1
Currency volatility

	Arg \$	Real	Mex \$	Chile \$	Yen	AUS \$	NZ \$	Safr \$	Can \$	Swe \$	Euro
1990-1995	1.71	25.25	8.90	7.44	10.67	8.14	6.67	5.93	4.44	11.94	...
1996-2000	0.45	6.68	8.08	4.99	11.79	9.94	10.12	9.58	4.80	9.97	10.62
2001-2004 (Oct)	15.67	16.63	8.02	9.25	9.43	11.41	12.06	18.55	7.18	11.17	10.57

Source: Central Bank of Chile, based on data from Reuters.

Note: The volatilities are computed with respect to the US dollar. The methodology used corresponds to "Riskmetrics", proposed by JP Morgan, where a Garch (1,1) approximation is achieved by modifying its specification, so that the standard deviation depends on the first lag in levels and variance of the first differences.

3. Monetary policy response

With respect to the reaction through interest rates, the empirical evidence for developed (Clarida et al, 1998) and emerging countries (Mohanty and Klau, 2004) confirms the pattern observed in Chile: inflation-targeting countries do react to exchange rate misalignment. And, as in the Chilean case, it is rarely done in a mechanical way. This is wise, given the extreme difficulties that authorities have in predicting future exchange rates and identifying movements away from their equilibrium levels.

Policy rule estimates by Schmidt-Hebbel and Tapia (2002) and Caputo (2003) confirm that there has been a reaction to fluctuations in the exchange rate, over and above its effects on expected inflation, but smaller than the reaction to expected inflation and output. It appears as if the exchange rate equilibrium were a target per se, which is inconsistent with having only one nominal anchor. In such a case, even if expected inflation were lined up with the target, monetary policy would react to deviations of the exchange rate from its equilibrium. This result is not surprising since it was obtained for

¹ For further details, see De Gregorio and Tokman (2004).

monetary policy reaction functions estimated during the 1990s, where there was a declared objective of exchange rate stability, implemented through an exchange rate band.

However, the above-mentioned results must be analysed with caution. In particular, a significant reaction to exchange rate deviations might reflect an overestimation of its effects on future inflation. In fact, if the inflation model used by the monetary authority is unable to fully anticipate a permanent reduction in the pass-through, the policy reaction to a given depreciation will be larger, as the expected inflation effect will also be larger. As a result, the ex-post reaction will appear to be bigger than it really is, suggesting a very reactive monetary authority. Alternatively, responding to exchange rate deviations on top of its effects on expected inflation might be reflecting reactions to expected inflationary effects that are farther away in time than the policy horizon. In such a case, the exchange rate reaction term is the response to an omitted variable (inflation in an excluded time horizon).

There is also an issue of endogeneity in the estimation of Taylor rules, as the exchange rate is determined by the interest rate, thus reducing the robustness of results obtained from reduced-form equations. In the same sense, there is an endogeneity problem in estimating whether monetary policy can have an effect on the exchange rate. Indeed, using SVARs for the Chilean economy, Parrado (2001) estimates that a contractionary monetary policy of 100 basis points produces a significant instant real appreciation close to 1%, which is undone by the twentieth month.²

The extent to which monetary policy responds to exchange rate shocks should depend on whether the authority has alternative instruments, such as capital controls and forex intervention, their relative efficacy under different circumstances, and the nature and persistence of the exchange rate shock. For example, there should be no monetary policy responses to temporary shocks, as they will not produce lasting effects and therefore will not modify inflation expectations in the policy horizon. However, this depends on the credibility of monetary policy. If credibility is low, temporary shocks will have more persistent effects on inflation, as the public will expect authorities to accommodate to higher inflation. Conversely, the effects will be minimised if the public perceives that monetary policy will be tightened if inflationary repercussions are significant.

One of the main benefits of having a flexible exchange regime is that it allows fast adjustments in relative prices in the face of real shocks, thus reducing their costs. Therefore, it is unlikely that interest rates will need to be moved in the face of exchange rate movements that are a response to real shocks (ie terms of trade or productivity shocks), since it is unlikely that they will have an impact on inflation. Indeed, movements in the exchange rate that respond to adjustments in the equilibrium real exchange rate will have smaller inflationary effects than movements that are not a response to changes in fundamentals. This is the main reason, as we argue below, for exceptional sterilised intervention.

Ultimately, in a flexible exchange rate regime, the authorities should react to exchange rate movements only if they impact the rate of inflation in the policy horizon, which, given the estimates of pass-through, is limited. Attempting to target a misaligned exchange rate, for example to artificially reduce inflation, may only bring costs, as the Chilean experience of limiting exchange rate adjustments has shown. However, preventing overreactions in the exchange rate from leading to inflationary pressures through monetary tightening, may reduce the costs of achieving the inflation target.

4. Exchange rate intervention

Alternatively, or complementarily, many countries react to exchange rate movements through some type of intervention policy. In fact, most countries classified as free-floaters intervene in the forex market.³ And even those that do not intervene have retained the option to do so in particularly stressful circumstances.

² This reaction is found to be small, nearly half of the one found for Australia, Canada and New Zealand (Zettelmeyer, 2000).

³ Only New Zealand and Poland have abstained from intervening and can be considered pure floaters. The US, Japan and the EU have intervened in the market at different points in time, but their interventions have shown a diminishing trend in frequency, while increasing in size. Other examples are the diminishing interventions required by European central banks

Two interesting issues emerge from the observed reactions to exchange rate movements through interventions. The first has to do with the high support they have received at the policymaking level, given the much more sceptical view in the academic world of interventions effectively producing a change in the exchange rate, its trend, or its volatility. The second is related to the decision to react through the forex market and not through monetary policy. We will leave this second issue for the next sections and will concentrate now on a broad review of the efficacy of interventions. In the next sections we will discuss the intervention experience in Chile and conclude with a discussion on the optimal response to exchange rate fluctuations.

In the context of a flexible exchange rate regime, there are three channels through which interventions in the forex market affect the exchange rate.⁴ The first one is the portfolio channel, whereby changes in the desired allocation of currencies in the portfolios of investors could cause large swings in the exchange rate. In this case the intervention of the central bank could reduce fluctuations by providing the necessary supply of currency to reduce fluctuations. The research that has analysed the effectiveness of intervention through the portfolio channel concludes that, more often than not, that sterilised interventions have very small short-run effects, mainly because intervention volumes are small.

A second channel through which intervention affects exchange rates is signaling. The idea is that an intervention provides signals about the future course of monetary policy, which in turn affects asset prices. For example, when intervention is undertaken to avoid depreciation, the next step would be to tighten monetary policy, which should strengthen the domestic currency. This view has received some empirical support, but we do not believe it is very relevant, because many times, and as we argue below in the case of Chile, intervention is done precisely to prevent a monetary tightening to avoid inflationary pressures stemming from excessive depreciation.

There is a third channel, called the information channel. In this case the authorities transmit certain information to the market via an intervention and its announcements. In the Chilean case, for example, this was that the exchange rate was moving out of line with the evolution of fundamentals. The empirical analysis of the information channel has centred on the microstructure of the foreign exchange market, concluding that the impact of the interventions is bigger, the larger the uncertainty in the market, as measured by exchange rate volatility.

While most central bank officers believe that interventions may have an effect on the exchange rate (Neely, 2001), the empirical evidence has been unable to provide robust support for that notion. In fact, although there have been swings in the prescribed efficacy of interventions through time, today the issue is still open to debate. The relative consensus reached by earlier studies regarding the small effect of sterilised interventions on the exchange rate (Jurgensen, 1983), was at conflict with the apparent success of coordinated interventions that followed the Plaza and Louvre agreements.⁵ Moreover, numerous recent studies have arrived to contradictory results.⁶

The disparity of results can be partly attributed to the presence of two empirical problems. The first one is lack of data, and stems from the reluctance of central banks to publish official intervention information, which makes the task of gathering statistics tedious and deficient.⁷ The second one is the

with the introduction of the euro in 1999, while the European Central Bank has intervened on only two occasions, both in the year 2000; the UK and Switzerland have not intervened since 1992, except in 2000, in a coordinated action to support the euro; and Canada abandoned its mechanical intervention rule, reducing its intervention activity substantially.

⁴ In many Latin American countries, including Chile in the 1990s, interventions were made to target a specific level or path for the exchange rate, but we do not examine them here because they are not consistent with the free floating we are discussing here. For further discussion see De Gregorio and Tokman (2004).

⁵ See, for example, Domínguez and Frankel, 1990 and 1993.

⁶ For a description of the later advances, see Sarno and Taylor (2001) and Ramaswamy and Samiei (2000).

⁷ Central banks normally do not make public announcements of their interventions, let alone disclose the amounts involved. Even when present, disclosures are few and infrequent in comparison to the time span in which one expects the market to adjust to intervention, often days or even hours. This deficiency has forced researchers to build indirect intervention series, resorting to sources such as media news, surveys and movements in international reserves. Since these proxies are far from perfect, it is possible that the intervention series built upon them are inadequate to estimate the true effects of exchange rate interventions.

inability to control for the endogeneity of interventions in the estimations of their effect on the exchange rate.

Fortunately, availability of information and reduced endogeneity bias due to the specific characteristics of the intervention policy followed in Chile during the floating exchange rate regime has allowed for an evaluation of its impact (Tapia and Tokman, 2004). The two intervention episodes after 1999 were found to have effects on the exchange rate, and are discussed below.

5. Chile's intervention experience

Chile is one of the countries that reserved the right to intervene when it adopted the floating regime in 1999. The monetary authority declared that, during exceptional episodes of uncertainty and volatility, under which there might be adverse economic effects of an overreacting exchange rate, it was desirable that the central bank intervene in the exchange rate market.⁸ Two such episodes occurred in 2001 and 2002, where the central bank, motivated by excessive volatility of the international financial markets and the potentially adverse effects, announced a package of intervention measures to provide more liquidity and foreign currency coverage. The first episode coincided with financial turmoil stemming from the convertibility crisis in Argentina, aggravated by the events of 11 September 2001, and the second with turbulence in Brazil during the presidential elections of 2002.

In both cases, there were clear indications that exchange rate depreciation was excessive, given the evolution of fundamentals. Chile's trade and financial links with Argentina and with Brazil are small. For example, trade with both countries combined is less than 20% of overall Chilean trade. The sharp depreciations clearly indicated that the market had lost its anchor, and hence they could have had adverse effects on inflation. These would have required tightening monetary policy in a period in which the economy was growing slowly and thus there were no inflationary pressures. Then, the intervention was seen as a first line of defense against inflation coming from excessive depreciation. The chance of a bubble dominating the market would have required actions to verify whether this was truly an overreaction. Had the central bank not intervened, the excess depreciation more than that required for adjusting the real exchange rate would have resulted in inflation undoing the real effects of the nominal depreciation. Indeed, it is likely that a depreciation that pushes the real exchange rate above its equilibrium level will bring inflation. This inflation, in turn, will validate an initially excessive depreciation. Before tightening monetary policy or giving up on the inflation target it could be advisable to intervene. This intervention does not pursue a particular level of the exchange rate, but aims rather to avoid an excessive weakening of the currency. If intervention is not effective, it is an indication that exchange rate movements could be the result of a need for a real depreciation. Given this reason, intervention should last for a limited period, and must be oriented at providing liquidity and reestablishing an orderly working of the forex market, rather than looking for a particular level for the exchange rate or aiming to reduce fluctuations. The purpose of the intervention is to prevent a rapid depreciation.⁹

The success of sterilised interventions in Chile showed that market reactions indeed were unfounded. Otherwise, intervention would have been ineffective, calling for monetary tightening if inflation expectations had been inconsistent with the target.

The first intervention started on 16 August 2001, when the central bank communicated that spot market interventions could occur up to a maximum of US\$2 billion, over the following four months. Additional sales of US\$2 billion of dollar-denominated central bank bills (BCD) were also announced.¹⁰ During that period, spot market interventions totaled US\$803 million, less than half the maximum announced, which represented nearly 5% of the total stock of international reserves. The spot trades

⁸ See box II.4 in the Monetary Policy Report of January 2003.

⁹ Given that the inflation target in Chile is symmetric, all the arguments given for excessive depreciation discussed in the text are also valid for excessive appreciation. We focus on depreciations since they have been the relevant issue in Chile in recent years.

¹⁰ This amount was in addition to that of the regular program of renewal of BCD's issued in 1998.

of foreign exchange were made in 15 interventions (15% of working days), and were substantially smaller than those made in the interventions during the crawling peg period, and less than half the amount exchanged during the unsterilised intervention to defend the peso in 1998.

The sale of BCDs added up to US\$3.04 billion, including the BCDs that were part of the regular rollover program. These were more frequent than interventions in the spot market and even than sales of BCDs in previous intervention periods. The amount above the regular program of BCDs sales was US\$ 2.3 billion, which led to a total intervention of US\$3.1 billion. During that time, the exchange rate appreciated 3.9% (partly reversing the depreciation observed until August), although it had accumulated a depreciation of nearly 5% in September. The maximum daily devaluation was 2.8% (September), and the maximum appreciation in one day was 1.8%, in October.

On 10 October 2002, the central bank announced a period of interventions very much like that of 2001, two billion dollars in spot and US\$ 2 billion in BCDs, to end on 10 February 2003. This intervention occurred with the Brazilian country risk rate climbing and a complex global scenario. The peso/dollar exchange rate depreciated 7% in one month, showing an accelerating trend, and without similar deterioration in fundamentals, except for turmoil coming from Brazil. Thus, these developments suggested that the exchange rate depreciated more as a result of contagion than of fundamentals. Contrary to the previous experience, however, the central bank actually did not intervene in the spot market. However, there were interventions, with the issue of dollar denominated debt. Furthermore, in December 2002, the Governor of the central bank announced the possibility of redefining the intervention strategy for the second half of the intervention period. A few days later, the BCD sale calendar was cut by half. Five hundred million US dollars in BCDs were sold in each of the first two months, October and November. Subsequently, the central bank considered that a milder intervention would suffice, and sold US\$250 million in each of the following months, December and January. Total intervention in this episode was US\$1.5 billion, without spot interventions. This episode involved much less intervention than the first one. Reserves did not change and the total stock of BCDs increased to US\$5.8 billion.

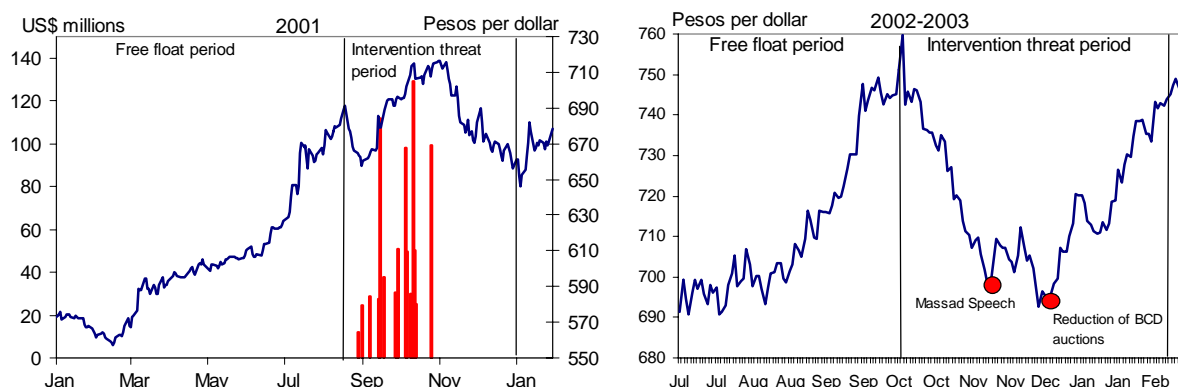
During this second episode, the exchange rate appreciated by 2.1% (partly reversing the previous depreciation), although by mid-December it had appreciated by 8.8%, to relapse in the following months. The biggest depreciation in one day was 1.3%, and a 2.3% appreciation occurred the day after the intervention announcement (see Figure 2).

During the second episode, the exchange rate gradually approached its initial level (Figure 2). The intervention was prompted by unusual increases in spreads in Brazil and emerging markets, but after the announcement that intervention would lessen because financial turmoil in emerging markets was diminishing, the exchange rate began depreciating again, and at a slower pace than the one that triggered the interventions (August-October). This episode shows, first, that the purpose of the interventions was not to target a specific level for the exchange rate, but rather to reduce the speed of depreciation. And, second, that the reaction of the Central Bank was based on turmoil in financial markets rather than, again, on the exchange rate reaching a certain level.

It is interesting to compare the evolution of the exchange rate in both episodes. As Figure 2 shows, the turmoil was much more intense in the first period, as even with significant spot market intervention there were strong pressures against the peso. These pressures came not only from the deterioration of the Argentine economy, but were also reinforced by the further weakening of the peso (by nearly 2%) that followed the terrorist attacks of 11 September 2001. In contrast, during the second episode the reaction to the announcement may, despite lower effective intervention, be explained by the credibility gained during the first episode. Nevertheless, the first impact, associated with the intervention announcement was, after controlling for other fundamental movements, not as strong as that of the first episode. This could also indicate that the market already assigned a high probability to the assumption that all resources committed to intervene would not be used, as actually happened. Therefore, the lesson is that announcements not followed by actions could reduce their impact on the exchange rate.

Figure 2

Exchange rate and spot foreign exchange market interventions



In terms of frequency and magnitude of interventions, Chile's intervention policy has been modest. It has only intervened in the spot market on fifteen occasions during the last five years,¹¹ and amounts have been low, both in absolute terms and relative to the market's average turnover. Spot interventions in 2001 averaged less than 5% of the daily volumes traded in the market, with no spot market interventions in 2002 or 2003. Most interventions were made by issuing dollar denominated debt.

As for transparency, the two announced intervention periods were very transparent by international standards. Contrary to the worldwide trend towards transparent public policies – following the good behaviour codes of the IMF – intervention policies around the world have not been very transparent. Secrecy is still the rule in most countries, although there is a trend towards more public interventions (Chiu, 2003). Canada, Hong Kong and the European Central Bank have compromised to provide information whenever interventions occur (typically through press releases). The US has maintained the possibility to intervene secretly, but has intervened publicly in its most recent episodes. In Japan, the degree of transparency has fluctuated substantially over time. Moreover, even in those countries that have moved towards more transparent interventions, the amounts involved have been kept secret (only Hong Kong makes a real time amount announcement). Most report amounts with delays or in monthly (as has Japan since June 2003) or quarterly (as have Canada, ECB and US) aggregate amounts. But in every case the information is provided ex-post or, at best, simultaneously. There is, in general, no evidence of ex-ante information on amounts and dates. In this sense, the last two intervention episodes in Chile were exceptions.

The specific form of Chile's intervention packages is of special interest, as it is not commonly observed in other countries. In Chile, interventions have been announced in advance, and the beginning and end of the intervention period have been made public. In addition, the maximum amount of the intervention in the spot and BCD markets, and the calendar for the monthly BCD placements, have also been made public. In practice, the only unknown intervention is the daily spot intervention, which is published as official data from the central bank with a two week lag. The rationale for the choice of high transparency is twofold. First, because the authorities have made a commitment to intervene in a transparent manner, rather than surprising the market, in order to work through the information channel. Indeed, intervention is done to let the market know that the authorities consider the evolution of the exchange rate to be unjustified by fundamentals (short- and long-term). Second, and more important, because intervention is intended to provide liquidity and stabilise the market, rather than being a fight against speculators. This strategy avoids creating an "addiction to intervention", especially in a country with a high level of reserves. There must be a full assessment before intervening, and this requires introducing some costs to the decision-making process. Thus,

¹¹ The median intervention frequency among the central banks surveyed by Neely (2001) was 25% of trading days throughout the 1990s.

intervention is more of a test for a potential bubble than an attempt to manage the exchange rate at levels that could end up in a misalignment. For this reason, it has never been ruled out that an intervention could be ineffective. If this were the case, the conclusion would be that the movement in the exchange rate is much closer to an equilibrium phenomenon than an overreaction.

For the Chilean case, Tapia and Tokman (2004) show that the authorities are capable of affecting the market not only through actual intervention operations, but also by public announcements and commitments regarding them. This is, after all, the mechanism operating in two of the classical channels through which interventions are effective: information and signaling. The information channel refers to views of the authorities that differ from those implicit in asset prices, while the signaling effect is related to the future course of monetary policy, ie after an intervention comes an interest rate hike. Public announcements, whether formal or informal, reveal relevant information to the asset market, which should adjust when news arrives.¹² Indeed, in the case of Chile, the announcement provides information that the central bank estimates that the depreciation is excessive.

However, the potential use of announcements as an effective intervention tool depends critically on the credibility associated with them. Empty promises that are not backed by actions (in the case of the portfolio or signaling channels) or that are made by authorities that are not considered reliable (in the case of the information channel) should have no effect or, if the market was misled this time, weaken the effect of future announcements. As the empirical methodology cannot distinguish the specific channel through which interventions operate, it is not easy to say if announcements must be followed by actual interventions. Under the portfolio channel, the announcement must necessarily be followed by interventions and, in fact, the central bank must have enough reserves for the announcement to be credible to begin with.

More debatable is whether the central bank must intervene when this is used as a signaling device or to provide information. Under the signaling channel, there is no clear need for intervening after making an announcement, because when intervention is used to signal a likely future tightening of monetary policy, tightening must happen. Credibility would diminish if monetary policy (not interventions) did not behave as implicitly suggested by the announcement. When the central bank uses intervention to inform the market that it believes there is an overreaction, at some point it will have to “put its money where its mouth” is. Therefore, via all channels through which intervention affects the exchange rate, authorities should take action, either through sterilised intervention or monetary tightening.

The findings in Tapia and Tokman (2004) suggest that Chile’s relatively infrequent and unique intervention strategy has succeeded in altering the exchange rate through its effect on expectations caused by the (credible) policy announcements made for both periods. Obviously, this result is conditional on the specific characteristics of the Central Bank of Chile, an independent institution with high credibility and a large stock of international reserves. This suggests that these results, or the policy prescriptions that might be derived from them, cannot be directly extended to other countries. Nor can they be directly extrapolated to other periods in time for the Chilean economy.

In the case of Chile the most important impact of intervention came from the announcement, but in both cases this was followed by action. We do not have evidence with which to evaluate what would have happened if the central bank had not validated the announcement with spot or BCD sales. However, it is most likely that its credibility would have weakened. The absence of spot and/or BCD interventions would have signaled lack of conviction accompanying the announcement. Moreover, it was a reasonable thing to do; considering the availability of reserves and an excessive depreciation, there was no reason for not shortening the central bank’s already very long position in dollars. Furthermore, as the comparison of the two intervention episodes shows, an “open mouth” intervention is not enough and may lose effectiveness if spot and/or BCD interventions do not follow. In any case, their timing and amounts will depend on the initial effects of the announcement and on the evolution of conditions that triggered the intervention.

¹² There is very scarce literature on the role of communication or official central bank statements. Some exceptions are Tivegna (2001), Fatum and Hutchinson (2002) and Jansen and De Haan (2003).

6. Conclusions and lessons on the optimal policy response to exchange rate shocks

Chile has moved gradually to a floating exchange rate regime. This has been a reasonable thing to do, especially because most of the recessions that the economy has endured have been associated with exchange rate rigidities: the fixed exchange rate of the early 1980s and the narrowing of the exchange rate band in the aftermath of the Asian crisis. Additionally, given the significant exposure to external shocks – particularly terms of trade shocks and fluctuating capital inflows – a regime that allowed a fast adjustment of relative prices was desirable and achievable through the flexibilisation of the exchange rate. Instead of being subjected to extreme fluctuations in interest rates and financial conditions as a means to control – often unsuccessfully – the exchange rate, it is sensible to let it adjust, especially because it allowed expenditure switching and resource reallocation in the presence of external shocks.

The float was implemented in accordance with the development of the financial markets and at a moment when such movement appeared to convey more benefits than costs. Financial stability was not threatened: the extent of currency mismatches in the banking and corporate sectors was small, and liability dollarisation of the banking system was also unimportant. Firms have been increasingly able to hedge their currency exposure in the derivatives market. Therefore, balance sheet effects stemming from exchange rate fluctuations pose a threat to neither the financial nor the corporate sectors. In addition, price stability was not at risk, given the low pass-through from depreciation to inflation.

From a macroeconomic point of view, moving to a flexible exchange rate regime was a necessary step to implement a credible inflation target. In Chile during the 1990s, there was exchange rate targeting with enough flexibility to accommodate the inflation target. This was the reason why, in the context of an exchange rate band, the widths and central parity were frequently adjusted, this being also an incentive for capital inflows as the authorities pursued a strategy of gradual appreciation (Cowan and De Gregorio, 2004). Thus, allowing the exchange rate to float would make the inflation target more credible and the economy more resilient to external shocks, as has proven to be the case in recent years.

Nevertheless, there have been some instances in which the central bank has intervened in the exchange rate market, but they have been exceptions. The most significant drawback of intervention is that authorities start intervening too often, denaturalising the float, which becomes a de facto managed system. In some sense, authorities could become “addicted” to intervention. This could work for a while, but in a country like Chile, with bad experiences in times of severe external turmoil, this is dangerous and has proven to be very costly. For this reason, interventions must be rare events and occur only in extreme circumstances. Their credibility, and thus their effectiveness, depends on them being only occasional. Moreover, they should become even more infrequent, as the reasons to fear floating appear to be fading with time.

For the above reasons, the method for conducting intervention is very relevant. Transparency and clear rules of the game are necessary to make this an exceptional policy. Accordingly, in Chile it is the Board of the Central Bank that decides exactly when intervention will occur and the maximum amounts of intervention, and explains this clearly to the public. In contrast, if interventions are secret, there is much more temptation to intervene whenever the market becomes volatile.

The question is now, what determines whether the central bank should react and how? There is little evidence on such issues, but some things appear to be a natural part of the decision process. In the first place, the potentially adverse effect of the shock must be substantial. In this sense, if the threats of financial instability and inflation are low, as is the case with Chile (De Gregorio and Tokman, 2004), then the need to react is diminished.

Also, the nature and the persistency of the exchange rate shock are important determinants of whether there should be a reaction at all. Real and temporary shocks are, most probably, better left alone. And, since a larger proportion of shocks is believed to be temporary in a floating regime, there is a lower probability of having to react to them.

The size of the shock may be important too. As Lahiri and Vegh (2001) suggest, forex interventions may be cost-effective in the presence of large shocks, as their fixed costs are lower than the costs associated with interest rate policies for large shocks. If authorities react by tightening monetary policy when facing a transitory and significant exchange rate shock, they may need to undo the tightening

after the shock has passed. This would undermine the effectiveness and credibility of monetary policy as the volatility of the exchange rate increased and the transmission to market interest rates, especially long ones, diminished.

The relative efficacy of different instruments is important too. Monetary policy has effects in the medium to long term, thus any policy reaction that is required to be fast cannot come through that channel. Additionally, there is no robust international evidence that forex interventions can have an effect on the exchange rate in the medium run. For Chile, the efficacy of the latest interventions does not imply that future interventions will have the same effect, given the high reliance they have on the way the public interprets policy actions. In this sense, intervention policy must be limited in order to maintain the credibility in the floating system and induce market participants to maintain hedged balances to avoid unnecessary traumas from sharp fluctuations. If credibility is lost, then monetary policy will have to be tighter in the future, as the effectiveness of sterilised intervention will be diminished.

The primary reason to intervene is that large movements, unwarranted by the evolution of fundamentals, may have an impact on inflation potentially requiring monetary policy actions that could be unnecessary if the forex market were working more smoothly. This was the case in Chile, particularly in 2001, where deflationary pressures and the positive output gap were suggesting a relaxation of monetary policy. But, the exchange rate depreciation suggested the opposite. After markets calmed down, in January 2002 the central bank initiated the most aggressive monetary loosening in Chile, with monetary policy interest rates declining from 6.5% in late 2001 to 1.75% in January 2004. However, eliminating the factors that produce fear of floating should reduce the chances of having to intervene, and improve the workings of the flexible exchange rate regime.

Finally, as to the motives for policy responses, there appears to be broad agreement with the claim that there is no role for an exchange rate target, and that interest rate policy should be restricted to the inflation target. In this context, and under normal conditions, the exchange rate should fluctuate around its longer-term equilibrium, although it could be subject to overshooting and high volatility. But it is difficult to think that authorities would have enough information to fine tune exchange rate movements, although in exceptional circumstances it may be justified, as discussed in this paper. In addition, the development of derivative markets should help to hedge currency risk, and if the authorities commit to stabilising the exchange rate, they may be providing implicit insurance and inhibiting the development of market-based hedges.

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Foreign exchange market intervention in Colombia

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Introduction

The use and efficacy of intervention in the foreign exchange market has been a controversial topic. Some think that this type of intervention is ineffective in influencing the level of the exchange rate, and can also be damaging, because it can increase the volatility of the rate. Others argue that intervention operations can influence the level of the exchange rate, and can help to calm disorderly markets. Yet, others argue that intervention operations are inconsequential, since they affect neither the level nor the volatility of exchange rates (Dominguez, 1998). No doubt, the observed disparate range of intervention policies between central banks, and within individual central banks over time, can in part be attributed to the different views concerning the effectiveness and consequences of central bank interventions.

In this regard, the Central Bank of Colombia (Banco de la República) offers an interesting example of a variety of intervention policies that can be adopted according to changing market conditions and policy priorities. Following the introduction of a floating exchange rate regime and the adoption of an inflation targeting scheme for monetary policy, the central bank put in place in November 1999 an option-based foreign exchange intervention mechanism aimed at two objectives: firstly, accumulating foreign reserves and secondly, controlling the volatility of the exchange rate. Two years later, the central bank extended the option-intervention mechanism to also include reduction of foreign reserves, thus making the existing option mechanism fully symmetrical. More recently, in September 2004, facing an escalating appreciation of the currency, the Colombian central bank announced its decision to introduce direct and discretionary intervention operations.

1. The use of options for foreign exchange market intervention

To our knowledge, the systematic use of options as a way of intervention in the foreign exchange market has only been used by the central banks of Colombia and Mexico. Currently, the central bank of Colombia might be the only one to maintain such a scheme.³ The main characteristic of this mechanism is its transparency and reliance on an auction system. The intervention is carried out in an open manner and with rules that are public knowledge. The benefit of using options arises mostly from the associated hedging operations related to the risk management of option portfolios.

By law, the Board of Governors of the central bank is directly responsible for exchange rate policy. However, through the Finance Minister - as one of the seven members of the Board - the government participates in intervention decisions. The central bank executes intervention in an independent manner and both the Treasury and the Colombian oil company are treated in the same way as any other market agent.

The objectives of intervention are:

- To avoid excessive movements of the nominal exchange rate in a manner consistent with achieving the inflation target;

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³ The central bank of Mexico in May 2001, in light of the significant accumulation of reserves achieved under the option scheme, decided to suspend the use of that mechanism.

- To strengthen the international liquidity position of the country by accumulating foreign reserves without compromising the achievement of the quantitative inflation target or causing the exchange rate to deviate from its fundamental values;
- To moderate excessive and abrupt movements in the exchange rate from its recent trend. This is in order to avoid creating expectations of appreciation or depreciation that can result in a significant deviation of the exchange rate from its fundamentals.

Currently, the Banco de la República has four types of options: two of them are intended for accumulating or decumulating international reserves and two for dampening excessive exchange rate volatility. Agents have access to these options only through auctions held by the central bank.

- *Put options (call options) for accumulating (decreasing) international reserves.* These options give the holder the right to sell (buy) foreign exchange to (from) the central bank. The amount of the options to be auctioned is set by the Board of Directors at its own discretion. The options are valid between the first and the last working day of the month immediately following the day of the auction (they have usually coincided with calendar months) or in the period specified in the announcement. The options can be exercised, partially or totally, during this period, as long as the condition for exercise is in place. The exercise condition for the put (call) option is that the representative market exchange rate (TRM, certified by the Banking Superintendence) be below (above) its 20 working day (arithmetic) moving average. The strike price of the option is the TRM of the exercise day. In the event that the put (call) options are totally exercised before their expiration date, the board of directors could announce new auctions.
- *Put (call) options for controlling volatility of the exchange rate.* These options can be held by the central bank the same day that the nominal exchange rate (TRM) is 4% or more below (above) its last 20 working day moving average. This condition also applies for the exercise of the option. The amount of the auction is set by the Board of Directors at its own discretion (it is currently set at US\$ 180 million). The strike price of the option is the market exchange rate (TRM) of the exercise day. The options expire one month after the day of the auction. The central bank could call a new auction whenever the exercise condition is met (even if the options that were auctioned have not expired). The amount of these new volatility options is announced at the same time that the auctions are called.

Dutch auctions are used for all interventions through options. Premiums are ordered from the highest to the lowest. Bids equal to or higher than the premium at which the amount offered is covered are granted at this premium. Each participant may include up to five bids with the restriction that, in aggregate, these may not exceed the total offered amount. The institutions that are allowed to participate in the auctions include the Treasury and the “foreign exchange market intermediaries”, the latter excluding brokers and retail currency exchange houses (*bureau de change*). On some occasions the Board of Directors announces auctions for put options, to accumulate foreign reserves, months in advance.

The use of public auctions of options enhances the visibility and openness of the foreign exchange intervention mechanisms for markets. It also gives Banco de la República the discretion to choose the timing and amount of foreign reserve adjustment. These decisions are usually taken at the monthly meeting where the Board of Directors analyses the inflation report. In auctions for volatility control, Banco de la República’s discretion is limited to fixing *ex-ante* the amount offered per auction and the tolerated deviation of the exchange rate from its 20-day moving average. After these parameters have been set, the auctioned call and put options to control foreign exchange volatility are triggered automatically.

Banco de la República also has the discretion to announce the amounts awarded in the auctions. In all cases, the intervention amount is announced to the public the same day that the option is executed by any of its holders. No entity or individual outside the central bank is supposed to have access to privileged information. Only two types of information are not disclosed: the name of the institution that exercised the option and the nature of the intervention (whether or not it has been sterilised). However, information on the level of reserves and the monetary base is published weekly on the central bank’s website with a delay of eight days. This allows market participants to infer the amount and nature of the intervention. Afterwards, information on whether the intervention was sterilised is revealed.

Annex Table A shows the frequency of intervention in the foreign exchange market. Overall, since the introduction of the option mechanism, the central bank has intervened 51 times, 45 of them to build up international reserves through put options.

Put options

As can be seen from Annex Table A, between November 1999 and September 2002, auctions of put options were performed on a monthly basis, with amounts that ranged between US\$ 30 million and US\$ 200 million. The regularity in the use of this type of options throughout this initial period responded to the need to build up international reserves, following the reduction that took place during the defence of the currency band in 1998 and the first three quarters of 1999. By using put options, the central bank of Colombia was able to meet the targets of international reserves established in the programme with the IMF approved in late 1999. Between its creation and the end of 2002, auctions of put options amounted to US\$ 1,879.7 million, of which US\$ 1,399.3 million (74.4 %) were exercised.

The ample volume of capital flows to emerging markets since mid-2003 and the sharp fall of spreads on sovereign debts translated into an appreciating trend of the exchange rates of these economies. The Colombian monetary authorities considered this as a temporary phenomenon, since a rise in US rates was anticipated. This view was reinforced by local factors, such as an expected decrease in both the volume of oil exports and the external financing of the public sector. In this context, the Central Bank decided in December 2003 to reinstate a sustained intervention through auctions of put options to accumulate international reserves. As a result, between December 2003 and August 2004 US\$ 1.75 billion of put options were auctioned, of which US\$ 1.5 billion were exercised (a 13.7% increase over the level of international reserves at the end of 2003). The objective of this substantial intervention was to further strengthen the liquidity foreign position of the central bank, as well as to prevent an abrupt and temporary appreciation of the exchange rate. Such continued intervention was not considered incompatible with the monetary policy stance, since inflation forecasts at the beginning of 2004 showed an undershooting of the inflation target for 2004 and 2005. In any case, to assure monetary consistency, the central bank sterilised about 50% of the monetary expansion through the selling of Treasury bills in the secondary market.

Call options

Between July and September of 2002 the Colombian currency depreciated 15% in real terms. This was not an isolated event, but part of a generalised phenomenon in Latin America associated with the so called “Lula effect” and perhaps with the corporate scandals in the US that induced international investors to move toward safer assets. These changes were also reflected in the evolution of the sovereign spreads (the EMBI Plus raised by 400 basis points). Although the pass-through in Colombia was relatively low (of around 0.04), it was large enough to jeopardise the achievement of inflation targets, despite an estimated negative output gap of around 2.5% (Ramírez, 2004).

In these circumstances, the Board announced in February 2003 its decision to decumulate up to US\$ 1 billion (9.2% of total international reserves), without specifying any period of time. From this amount, the Central Bank effectively auctioned call options by a total of US\$ 600 million during March, April and May 2003, with an offered sum of US\$ 200 million each month. Only US\$ 345 million of that total was exercised. These interventions were aimed at curbing the increasing depreciation trend, which was judged to be incompatible with the achievement of the inflation target. It has been considered that the most important effect of this intervention on the exchange rate was associated with the announcement rather than with the intervention itself.

Volatility options

The volatility control mechanism through call options was automatically activated in July, August and October 2002, by an amount of US\$ 180 million each time. From a total auction of US\$ 540 million, US\$ 414 million was exercised.

2. Effectiveness of the foreign exchange intervention

The option-intervention mechanism was not designed to target any specific level of the exchange rate. In the case of put options for instance, their amounts auctioned in the market have usually been below one third of the average daily turnover. The central bank buys dollars at the official exchange rate determined by market transactions of the day before. These options have a one month maturity and they can only be exercised when the exchange rate falls (appreciates) below its 20-day moving average. With all these features, the exchange rate can substantially appreciate in periods in which put options are operating.

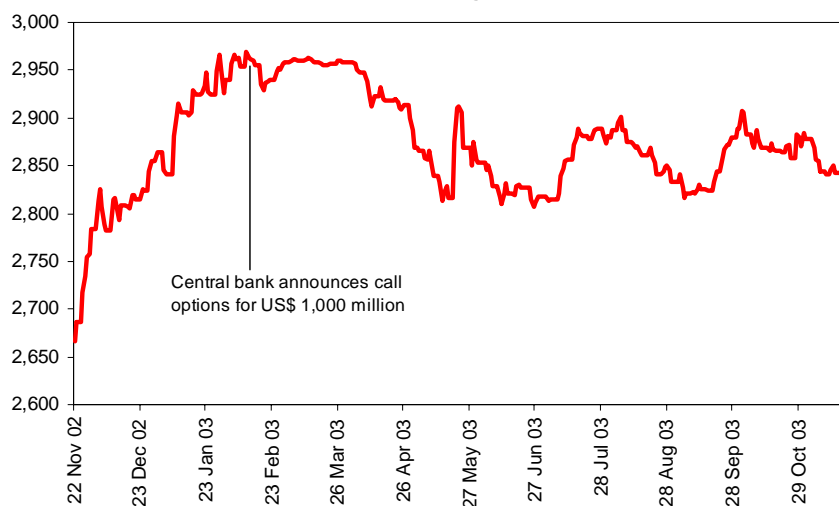
Thus, put options must not be judged for their effects on the exchange rate, but rather for their performance as a mechanism for reserve accumulation. From this point of view, the objective of this type of intervention has largely been achieved. As is shown in Annex Table A, nearly US\$ 3.2 billion in reserves have been bought since put options were introduced. The use of this mechanism and the returns obtained from central bank investments have allowed Colombia to substantially increase its foreign reserves, up to a level that comfortably conforms to international precautionary standards. At no point have the central bank or the markets deemed that this reserve accumulation could jeopardise the achievement of the inflation target.

Call options to sell international reserves have been oriented towards influencing the exchange rate (although not necessarily pursuing any specific exchange rate level). In fact, as discussed above, these options were intended to bring under control an increasing depreciation trend that was deemed at the time to be jeopardising the achievement of the inflation target. Accordingly, the success of these interventions must be assessed in terms of their ability to stop the depreciation trend.

As can be seen in Figure 1, the nominal exchange rate stabilised immediately after the announcement of the call auction in mid February 2003 and then it began to appreciate slowly. The auction for foreign reserve deployment was made public jointly with the decision of the Board of Governors to sell up to US\$ 1,000 million through this mechanism. These announcements came after a 100 basis point hike in the Bank's interest rate in January 2003 that was followed by another one of the same magnitude in April 2003.

With a stable exchange rate and with food prices falling, inflation and inflation expectations slowed down and then started to fall. In view of this behaviour, the Board suspended call options in June 2003. Total inflation at the end of 2003 was 6.49 percent, just 49 basis points above the upper limit of the target range (5-6%). This was achieved in a year in which the value added tax of some products was increased and during which there was a large increase in utilities and gas prices. In this way, intervention in the foreign exchange market served as a complement, not as a substitute, of the monetary policy tools of the central bank. In fact, in conjunction with foreign exchange intervention, the central bank raised interest rates 200 basis points during the first half of 2003.

Figure 1
Nominal Exchange Rate



On the other hand, the central bank's volatility options prevented abrupt and excessive deviations of the exchange rate, once they were automatically triggered. To illustrate this, Annex Table B shows the daily representative exchange rate (TRM), and its deviation from its 20-day moving average between July and August 2002. As can be seen, the exchange rate did not deviate more than 4.3% from its moving average, subsequently appreciated 0.5% six days after the second volatility option was exercised, and then remained within 2.5% of its moving average during the following weeks. A similar phenomenon was observed in October 2003 (not shown). In that sense, volatility options achieved the purpose for which they were designed. Nonetheless, there are doubts about the efficiency of the mechanism (as it can be very expensive if there is a strong devaluation of the peso) and whether they should or could be substituted with the options to accumulate and sell reserves.

An alternative way of assessing the effectiveness of foreign exchange intervention is by using the event analysis approach, as applied for Colombia by Ramírez (2004), following Edison et al (2003) and Mandeng (2003). Event studies rest on the actual observation of asset prices over relatively short time periods and are particularly helpful when, due to small samples, the use of more sophisticated techniques such as GARCH models is not feasible. The event window is set as the depreciation of the currency 20 days before intervention, during it, and 20 days after intervention. An intervention is said to be successful in the short term if the change in the exchange rate in the episode of intervention reverses the trend in the exchange rate from the previous 20 days. An intervention is said to be successful in the long run if the change in the exchange rate 20 days after intervention reverses the trend in the exchange rate prior to the intervention. An intervention fails (both in the short and long run) if there is no reversal in the trend of the exchange rate. Two intervention episodes are examined: call options (decumulation of international reserves) and call volatility options.

The results are shown in Table 1. According to the criteria mentioned above, it can be said that call options to decumulate international reserves and call volatility options were successful both in the short and in the long run, which confirms the observation made before. Strictly speaking the performance of call volatility options should be assessed on the basis of a measure of *volatility*, rather than simply the trend of the exchange rate. Such an assessment was made by Mandeng (2003). It was found that the volatility options sold in July and October 2002 were moderately successful in meeting the objective, while those sold in August 2002 were unsuccessful.

Dates	Intervention (US\$ mill)	Level exch. rate	Change 21 days before intervention	Change during intervention	Change 21 days after intervention	Short-term success ¹	Long-term success ²
Call options (decumulation of international reserves)							
03/03/2003 - 03-10-2003	65.0	2958	1.07	0.06	-0.72	yes	yes
03/19/03	79.6	2956	0.72	-0.02	-1.21	yes	yes
05/20/03	199.9	2875	-1.53	2.07	-1.58	no	yes
Call (volatility)							
07/29/2002 - 03/10/2003	289.5	2596	8.53	3.24	1.91	yes	yes
10/02/2002	124.5	2885	7.69	1.22	-3.70	yes	yes

¹ Short-term effectiveness determined by whether direction of change in exchange rate on day of intervention reverses trend in exchange rate from previous 21 days. ² Long-term effectiveness determined by whether direction of change in exchange rate 21 days after intervention reverses trend in exchange rate from previous 21 days.

Source : Ramírez (2004).

3. Consistency of foreign exchange interventions with inflation targeting

The consistency of foreign exchange interventions with inflation targeting (IT) depends on whether or not the intervention is supportive of policies for achieving the goals of IT. Accordingly, IT-consistent interventions should loosen/tighten monetary conditions when the inflation forecast is below/above the inflation target, and/or the output gap is negative/positive. Moreover, the interest rate has to be the principal instrument of monetary policy and possible interventions in the foreign exchange market

ought to be only a complementary tool, and just in exceptional circumstances (high volatility, serious misalignments and/or disorderly market conditions).

On this basis, Ramírez (2004) shows that interventions in Colombia have been “target and regime consistent”. Most of the time policy interest rates moved in the same direction, and changes in the monetary policy stance came first through changes in interest rates and then through interventions in the foreign exchange market (Table 2).

Table 2
Consistency of foreign exchange interventions

Month at which forecast was made:		Deviation from target	Ex-post deviation	Output gap	Interest rate trend	Target consistency
<i>Interventions to decumulate int. reserves</i>						
03/2003	2003	+122bp	50 bp	-2.42%	Up	Yes
	2004	+68bp		-1.45%		
05/2003	2003	+56bp	50 bp	-2.30%	Flat	Yes
	2004	-36bp		-1.22%		
<i>Interventions to accumulate int. reserves</i>						
10/2002	2003	-65bp	150/50 bp	-1.64%	Flat	Yes
12/2003	2004	-77bp		-0.36%	Down	Yes
01/2004	2005	-46bp		-0.78%		
04/2004	2004	-15bp		-1.12%	Down	Yes
	2005	-10bp		-0.86%		
<i>Interventions for volatility reasons</i>						
06/2002	2003	-46bp		-2.43%	Flat	?
10/2002	2003	-65bp		-2.34%	Flat	?

Source: Ramírez (2004).

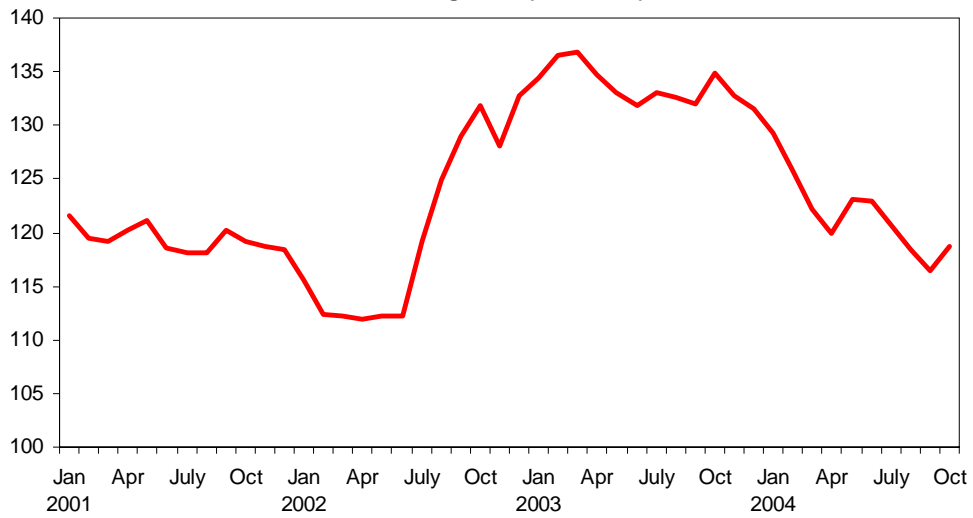
Interventions to accumulate international reserves were carried out when the inflation forecasts pointed below target, and interventions to decumulate international reserves occurred in the opposite situation. Moreover, in each episode the Inflation Reports explicitly identified the exchange rate movements as one of the direct causes for target under or overshooting. The only exception was the case of intervention through volatility call options in 2002. However, the purpose of these interventions was different and cannot be judged with the same criteria.

4. Direct intervention

On 29 September 2004, the Board of the Banco de la República announced its intention of buying up to US\$ 1,000 million in the foreign exchange market during the last quarter of this year. It was decided to perform this intervention in a discretionary way - that is to say - not necessarily using the put options mechanism. This decision was motivated by the continuing real appreciation of the exchange rate over the last year and a half (between April 2003 and October 2004 the real exchange rate appreciated 13.3 percent, Figure 2). The central bank of Colombia is aware that periods of prolonged appreciation in the past have resulted in a sharp deceleration of economic activity (1982-84) or even in an economic crisis (1998-99).

For this reason, even if the Banco de la República does not have a specific target for the exchange rate, the Board decided to perform a direct intervention, in order to try to moderate the effects that this appreciation cycle could have on the tradable sector. The Board considered that given the lengthy appreciation process, put options were not the best suited mechanism for reserve accumulation, as that is an instrument better designed for offering a short term hedging, than for facing a sustained appreciation. An assessment of the effects of this intervention will be made in due course.

Figure 2
Real exchange rate (1994 = 100)



5. Conclusions

The Colombian experience with option-based exchange market interventions has fulfilled its objectives. The scheme has offered economic agents a practical instrument of risk coverage against unexpected exchange rate fluctuations. By using put options it has been possible to accumulate international reserves for about US\$ 3.2 million without compromising the inflation target or affecting the trend of the exchange rate. Call options to sell reserves have been an important support for the implementation of monetary policy and the stability of the local currency. Finally, call-volatility options have contributed to curb acute exchange rate deviations, thus helping to reduce market uncertainty.

Annex

Table A
Foreign exchange market intervention*

Month	Put options to accumulate reserves		Call options to sell reserves		Call volatility options	
	Auction amount	Auction exercises	Auction amount	Auction exercises	Auction amount	Auction exercises
November	200.0	200.0				
December	80.0					
Total 2000	280.0	200.0				
January	80.0	12.0				
February	80.0					
March	100.0	74.0				
April	55.0					
May	100.0					
June	100.0	15.5				
July	100.0					
August	99.9	17.1				
September	100.0	100.0				
October	100.0	100.0				
November	100.0					
December	100.0	80.0				
Total 2001	1,114.9	398.6				
January	75.0	69.3				
February	50.0					
March	50.0					
April	30.0	30.0				
May	30.0	30.0				
June	30.0	30.0				
July	30.0	30.0				
August	80.0					
September	100.0	100.0				
October	140.0	140.0				
November	119.9	119.9				
December	50.0	50.0				
Total 2002	784.9	599.2				
January	49.9	1.5				
February	50.0	50.0				
March	100.0	100.0				
April	100.0					
May	100.0					
June	100.0					
July	50.0				180.0	180.0
August	50.0				180.0	109.5
September	50.0	50.0				
October					180.0	124.5
November						
December	50.0					
Total 2003	699.9	201.5			540.0	414.0
January						
February						
March			200.00	144.66		
April			200.00			
May			199.9	199.9		
June						

Table A (cont)

Foreign exchange market intervention*

Month	Put options to accumulate reserves		Call options to sell reserves		Call volatility options	
	Auction amount	Auction exercises	Auction amount	Auction exercises	Auction amount	Auction exercises
July	50.00	6.2				
August						
September						
October						
November						
December	300.0	300.0				
Total 2004	350.00	306.2	599.9	344.55		
January	200.0	200.0				
February						
March	200.0	200.0				
April	250.0					
May	200.0	200.0				
June	199.9	199.9				
July	199.8	199.8				
August	200.0	200.0				
September						
October						
Total	1,449.6	1,449.6				
Accumulated total	3,679.3	3,155.1	599.9	344.5	540.0	414.0

* US\$ millions.

Table B
Call volatility options

Date	Exchange rate	Exchange rate TRM moving average %	Auction amount (USD m)	Option exercised (USD m)
02-Jul-02	2398.80	1.5		
03-Jul-02	2410.50	1.8		
04-Jul-02	2425.40	2.2		
05-Jul-02	2426.40	2.0		
08-Jul-02	2434.30	2.1		
09-Jul-02	2457.40	2.8		
10-Jul-02	2462.20	2.8		
11-Jul-02	2482.20	3.3		
12-Jul-02	2506.80	4.0		
15-Jul-02	2514.00	3.9		
16-Jul-02	2507.20	3.4		
17-Jul-02	2499.90	2.8		
18-Jul-02	2524.80	3.5		
19-Jul-02	2538.50	3.8		
22-Jul-02	2529.60	3.1		
23-Jul-02	2517.40	2.3		
24-Jul-02	2539.00	2.9		
25-Jul-02	2572.40	3.9		
26-Jul-02	2580.20	3.8		
29-Jul-02	2596.30	4.0	180	117
30-Jul-02	2599.60	3.7		
31-Jul-02	2625.10	4.3		63
01/Aug/02	2636.30	4.3	180	69
02/Aug/02	2640.40	4.0		17
05/Aug/02	2643.00	3.7		
06/Aug/02	2663.80	4.1		
08/Aug/02	2670.60	3.9		23.5
09/Aug/02	2649.30	2.8		
12/Aug/02	2568.80	-0.5		
13/Aug/02	2595.80	0.4		
14/Aug/02	2658.00	2.5		
15/Aug/02	2635.90	1.4		
16/Aug/02	2648.80	1.7		
20/Aug/02	2663.60	2.0		
21/Aug/02	2620.90	0.2		
22/Aug/02	2626.20	0.2		
23/Aug/02	2653.00	1.0		
26/Aug/02	2643.40	0.5		
27/Aug/02	2653.30	0.7		
28/Aug/02	2672.30	1.3		
29/Aug/02	2688.60	1.7		
30/Aug/02	2712.50	2.5		

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Forex interventions: the Czech experience

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Introduction

This note discusses the role of foreign exchange interventions in the Czech inflation targeting regime since 1998. It does not aim to provide an exhaustive analysis using econometric techniques, but rather to summarise the major stylised facts and policy considerations. This may be useful on several grounds. First, the Czech National Bank's (CNB's) approach to managing the exchange rate float 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 were to face another period of exchange rate turbulence in the future. Second, the Czech experience may contribute as an interesting case study to the growing international literature on managed floating. The operational issues of the foreign exchange interventions are an important aspect of this debate. Finally, there may also be lessons for future ERM II membership, in which foreign exchange interventions may gain in importance.

I will 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 exchange rates. These verbal interventions may be no less important than the direct ones. They are not dealt with here, however, as they do not pose such big challenges, for example, in terms of sterilisation costs or communication openness, which this note discusses.

The note is organised as follows. Section I describes exchange rate developments in the Czech Republic. Section II presents major policy steps in exchange rate management. Section III summarises some stylised facts on the effectiveness of foreign exchange interventions. Section IV analyses the sterilisation costs. Section V is devoted to the public communication of foreign exchange interventions. Section VI summarises and concludes.

1. Exchange rate developments

From the beginning of its economic transition the Czech Republic (Czechoslovakia until the end of 1992) used a fixed exchange rate regime with a narrow band towards a basket of foreign currencies. The band was widened to $\pm 7.5\%$ in February 1996 and abandoned in May 1997, after a bout of currency turmoil that forced the CNB to introduce a managed floating system. In late 1997 the CNB announced that it would use the inflation targeting regime as a new nominal anchor for the economy, starting from January 1998. This regime has been in place since then, even though it has gone through an evolutionary process as far as its particular details are concerned (including exchange rate management issues - see below).

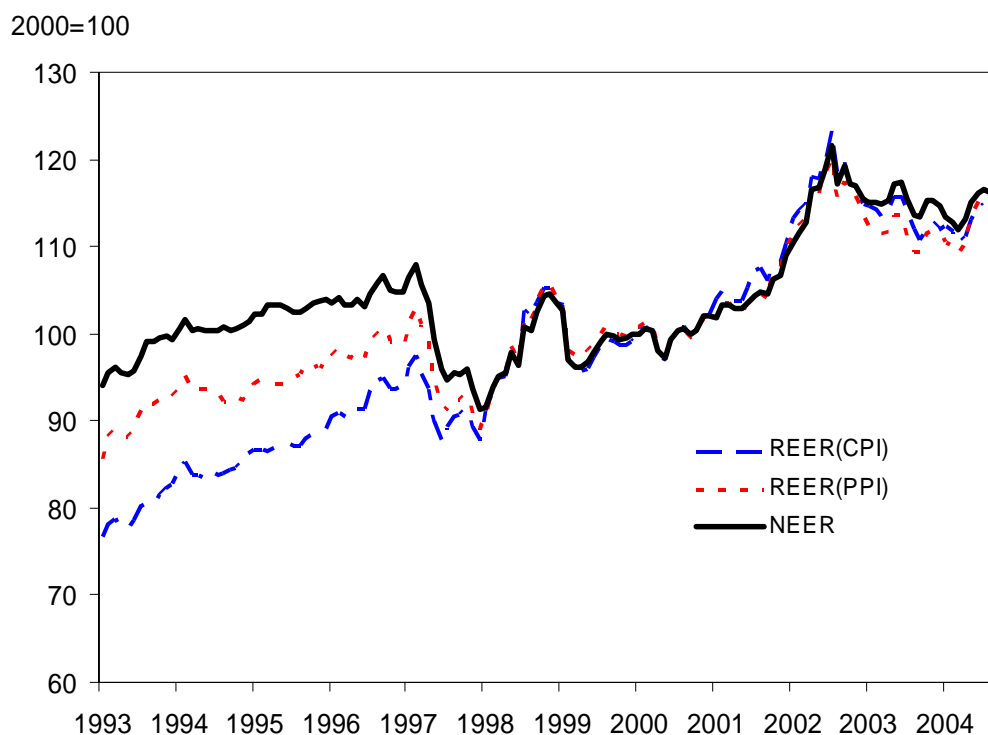
In this section, I briefly describe the exchange rate developments of the Czech koruna. Figure 1 shows the koruna's monthly nominal and real effective exchange rate, based both on CPI and PPI, since 1993.

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 exchange rate regime changes. Before 2001, real appreciation was mainly driven by an inflation differential, since then it has been through a 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, deregulation of administered prices, etc. 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 coordinate exchange rate expectations in one direction, ie towards appreciation.¹ The price convergence process may also contribute to volatility of the exchange rate if 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.

Figure 1

Koruna's nominal and real effective exchange rate



Source: Czech National Bank.

Figure 1 also shows that the medium-term volatility (ie fluctuations around the long-run trend) 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 koruna has experienced two waves of rather sharp appreciation in recent years, which were only followed by depreciations to (or below) the trend level with some time lag. The first wave took place in 1998, when the koruna appreciated above its pre-floating level, in spite of the crises in Russia and Latin America. The second, and more pronounced, wave started in 2001 and lasted till late 2002. Although these two periods were both affected by other strong external influences and price shocks, it is probably more than a coincidence that both these cases were marked by sub-trend economic growth and undershooting of the CNB's inflation targets.

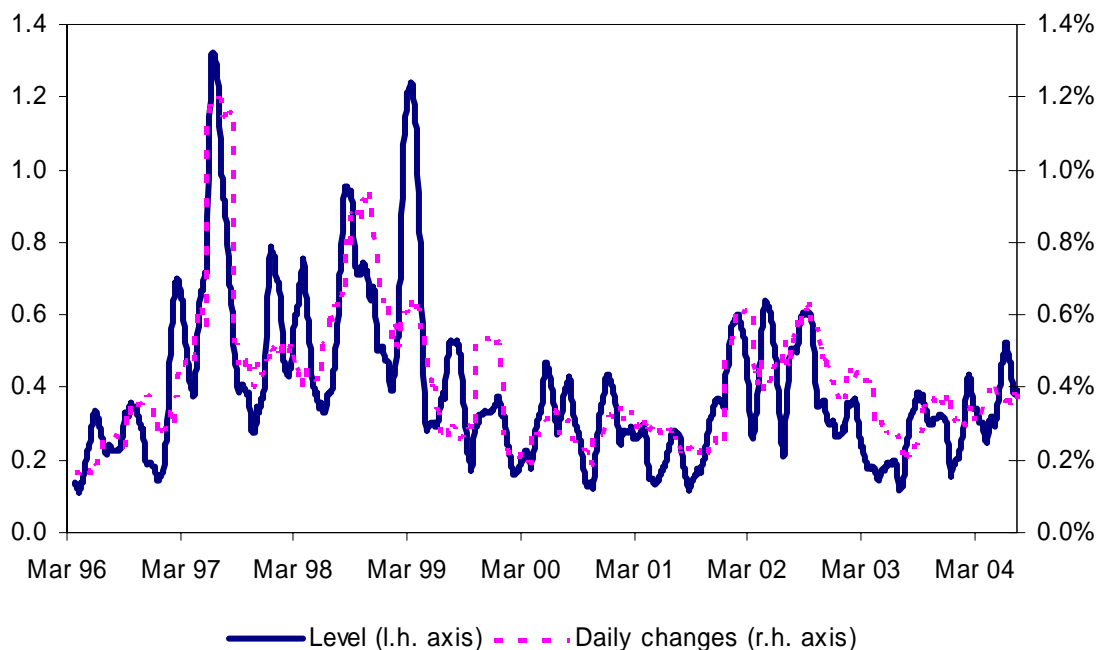
The short-term volatility is summarised in Figure 2 by a moving 60-day standard deviation of the koruna/euro exchange rate in terms of both absolute level and daily percentage changes. From this figure, one can see that the short-run volatility of the exchange rate was, as expected, greatest in the turbulent 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 exchange rate's short-term volatility was

¹ It might thus be one alternative explanation why interventions have been biased towards purchases of foreign exchange in the Czech case (see below).

observed during the appreciation episode of 2002, even though its magnitude remained - perhaps a bit surprisingly - well below the previous peaks.²

Figure 2

Volatility of the koruna/euro exchange rate (60-day standard deviation)



2. 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 Deutsche mark (euro 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 summarises 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 belong to the period of inflation targeting) the interventions de facto always concerned purchases of foreign exchange to slow down exchange rate appreciation (see Figure 3).³

The periods of high intervention activity were typically followed by quite long periods of no interventions. The most active periods were (i) February-July 1998; (ii) October 1999-March 2000; and (iii) October 2001-September 2002. In the first and third cases, this coincided with the periods of fast nominal effective exchange rate appreciation (Figure 1), which peaked above 15% year-on-year. In the second case, the koruna appreciated against the euro, but it depreciated quite strongly against the US dollar at the same time, due to the euro/US dollar exchange rate developments. As a result, there

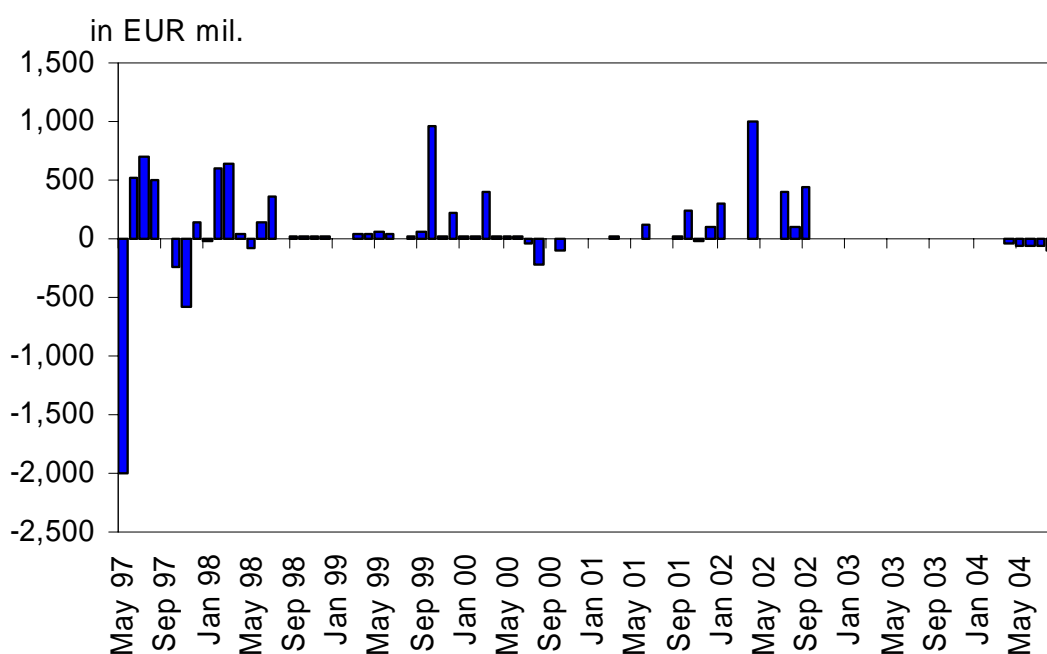
² The short-term volatility of the koruna’s exchange rate is analysed econometrically in Bulíř (2003).

³ In 2004 the CNB started selling earnings on its foreign exchange reserves to prevent them from growing further (see the end of data sample in Figure 3). This step, however, was not intended as a monetary policy measure, but as a balance-sheet adjustment step.

was no strong nominal effective exchange rate appreciation (Figure 1). This might be interpreted as an indirect 'confirmation' of the euro's reference-currency role in the Czech managed floating.

There are two interesting questions concerning the use of interventions. First, what was the main trigger for interventions, and second, why they were so skewed towards interventions against appreciation? Concerning the first question, one can point to medium-term exchange rate volatility and its impact on macroeconomic developments as the primary trigger of interventions. By this I mean that the CNB usually responded to fast exchange rate movements that exceeded any reasonable equilibrium trend and extended beyond the normal high-frequency volatility of the exchange rate. Such exchange rate developments have a potential to influence the inflation rate and economic activity, both through the direct exchange rate channel and most likely also by bringing the exchange rate out of line with the fundamental value (no matter how difficult it is to determine this precisely). This being said, the first and third intervention episodes also coincided with periods of relatively high short-term exchange rate volatility (Figure 2), which may serve as an additional explanation for the use of interventions.

Figure 3
The foreign exchange interventions (spot)



Source: Czech National Bank.

The second question, concerning the interventions' asymmetry, can be rephrased to query why the CNB did not react to the depreciations of the currency in the same way it did to fast appreciations. An easy answer could be that the central bank was trying to influence the long-run exchange rate trend or targeting a particular level of the exchange rate. Nevertheless, I do not subscribe to this point of view. The long-run appreciating trend has openly been acknowledged in the CNB's strategic documents, and no specific exchange rate targets exist at the CNB, even internally. The asymmetry may thus rather be related to the coordination effect on market expectations of the real appreciation trend (see above) and/or to the inflation target undershooting and an output gap negative since 1997, and which required a relaxation of monetary conditions under the inflation targeting regime (see Holub (2004)).

Besides direct interventions in the foreign exchange market, the CNB has also adopted other measures in response to exchange rate developments. A special account for the government's foreign exchange privatisation revenues was established at the CNB in early 2000, with the aim of reducing 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, entailing a possible distortion of the market equilibrium. From this point of view, it was regarded by the CNB as justifiable to offset this influence with a coordinated, non-standard action by the authorities. Moreover, it was also believed that the special account would have a stronger signalling effect on the market than its potential alternative, ie direct interventions by the CNB in the market.

An important aspect of this privatisation account has been facilitated communication between the CNB and government on 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. With the largest privatisation sales still to come (electricity, gas, telecommunications, etc), which were cited by 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 fiscal needs to be financed from 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 euro 4.2 billion from the state. Besides being a decision taken to postpone issues of the government's eurobonds, the aim of matching public foreign exchange revenues and outlays (and matching foreign exchange assets with liabilities), etc became more important.

It is also important to keep in mind that the interventions can not be assessed in isolation from changes in the main monetary policy instrument, ie short-term interest rates. The interest rate changes may support the effectiveness of interventions, both via the traditional arbitrage conditions and through the credibility channel. I argued in Holub (2004) that the interest rate changes and interventions should be viewed as reinforcing tools rather than as substitutes. In other words, in order to avoid a loss of monetary policy credibility, the interventions should not go in the opposite direction to the interest rate moves. Moreover, the policy framework should acknowledge that interest rates and interventions are not two independent instruments that would allow the authorities to achieve their price stability objective with their preferred configuration of interest rates and the exchange rate. In the Czech case, nominal interest rates were on a declining trend from the introduction of inflation targeting, with an exception of four minor interest rate hikes so far (by 0.25% in March 1998, July 2001, June 2004 and August 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.

3. Some 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 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 (ie 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 exchange rates. It would also be necessary to study in detail the microstructure of the koruna's market (see Derviz (2003) for such an analysis), which goes beyond the scope of this note. I thus limit myself to a discussion of some stylised facts. These are summarised 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 euro 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 koruna 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 euro 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 euro 500 million, but the koruna depreciated only with some lag, which coincided with the out-break 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 gone on appreciating further).

The immediate impact of the interventions thus looks quite uncertain, but the impact occasionally might last up to two or three months according to the Czech experience. No particular, ideal intervention strategy (eg 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. A key issue for the effectiveness seems to be how the interventions interact with market expectations, which may be very different in different periods. This is, unfortunately, quite hard to tell before an intervention is actually carried out.

Table 1
Effectiveness of foreign exchange interventions
Some stylised facts

Starting month	Final month	Overall volume ⁴	koruna/euro (ECU prior to 1999)						
			t-3M average	t-1M average	Start of t	Low of [t;T]	End of T	T+1M average	T+3M average
(t)	(T)	euro million							
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 most recent experience, in late 2001 and during 2002, fits rather well into this picture. When the exchange rate started to appreciate abruptly in the second half of 2001, it was usually 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 (euro 240 million) and December 2001 (euro 100 million). At the same time, from October 2001 the CNB 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 (unprecedentedly) and removed the major alleged source of appreciation.⁵ The major

⁴ To get a feeling of the relative scope of the CNB's interventions, note that the average daily turnover in the koruna foreign exchange market was about US dollar 700-800 million (euro 800-820 million) in 2002. The Czech yearly GDP is roughly equivalent to euro 75 billion.

⁵ 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 (ie 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)

explanation for the continued strengthening shifted from the privatisation revenues to the long-run, real appreciation trend of the Czech koruna.

Therefore, the CNB Board held an extraordinary meeting on 21 January 2002, at which it decided to carry out open foreign exchange interventions (altogether euro 305 million in January 2002) and an interest rate cut of 0.25% points. The koruna weakened by slightly less than 1.5% on that day, but was back at its pre-intervention level in four days and continued strengthening at a pace that even accelerated till the beginning of April 2002. On 4 April, the CNB thus started to openly intervene again. Overall, the volume of interventions reached euro 1 billion during April 2002. The exchange rate ended the month where it had been at its beginning (see Table 1), which was perhaps a rather disappointing result, given the high intervention volume, although 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 market expectations are set in one direction and the central bank tries to “lean against the wind”.

Nevertheless, the “undisclosed” interventions that the CNB made in July-September 2002 (together roughly euro 1 billion) seem to have had an important effect. The koruna/euro 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 market expectations, supported by some adverse macroeconomic news; (ii) a negative interest rate differential, making the koruna less attractive for investors; (iii) a change in the market’s perception of 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.

Changed market expectations were probably the most important factor. Once market expectations ceased to be skewed towards appreciation, and the one-sided bets became less interesting due to a combination of a zero interest rate differential with more exchange rate uncertainty, it was perhaps a matter of time only until some negative fundamental news initiated 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 effectiveness of interventions, and both critics and supporters of 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 of using them more systematically as a policy instrument under the inflation targeting regime.

4. Sterilisation costs

It is widely accepted that 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 euro 22 billion (koruna 700 billion).

This has important 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 threefold. The liquidity is sterilised using reverse repo operations, the volume of sterilisation reaching

about koruna 460 billion at present. This means that the sterilisation costs are substantial compared with the monetary income (seigniorage) the CNB can earn due to its monopoly of issuing currency. Indeed, there are accumulated losses from the past in the CNB's books that reached koruna 72 billion at the end of 2003, and are likely to increase even further at the end of 2004.⁶

The overall sterilisation costs can be estimated as a difference between the koruna 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). Table 2 shows an estimate of the CNB's sterilisation costs calculated for the period of 1993-2003 from Holub (2004). 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 the issue of CNB 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 appreciation of the exchange rate within its widened fluctuation band. From 1997, ie under the floating, the estimated costs were 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 koruna 190 billion (8-10% of yearly GDP at present).

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 pure floating.⁷

Table 2
Estimated sterilisation costs

Koruna billions

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
Exchange rate gains/losses	-0.3	0	0.2	-8.6	44.7	-35.6	31.8	-3.5	-40.1	-26.2	-29.8
Estimated costs of sterilisation	-1.6	-4.1	-14.5	-36.1	8.6	-72.1	18.5	-4.4	-38.1	-20.9	-25.3

Source: Holub (2004).

It should be also mentioned that 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 where sterilisation costs are potentially high, which might further increase costs, as unsuccessful interventions tend to be more costly than the successful

⁶ These accumulated losses, however, do not reflect the sterilisation costs only, but also past quasi-fiscal operations by the central bank, such as its involvement in the clean-ups of ailing banks (Holub (2001)) or the cost of the Czechoslovak federation split-up. These transformation costs alone had the same order of magnitude as the CNB's accumulated loss.

⁷ Unfortunately, the scope for a central bank to reduce sterilisation costs is quite limited once high foreign exchange reserves are accumulated on its balance sheet, if it does not want to influence the exchange rate substantially or to give up its monetary policy goals. One possibility is to start selling the reserves gradually. This was in fact the motivation behind the CNB's decision to start selling the earnings on its foreign exchange reserves to prevent their further growth - see footnote 3.

ones (there is thus a self-fulfilling element in an intervention's financial credibility).⁸ If 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 in 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 the eurozone became negative, which led to the interventions being viewed by the market as profitable.

5. Communication issues

Typically, the procedures governing decisions on interventions are much less clearly defined than the rules for interest rates. The international standards on transparency of exchange rate management policies are rather vague, compared with other policy areas. On the one hand, there are arguments in favour of clarity on the mandate, rules and procedures for the authorities carrying out interventions. On the other hand, it is acknowledged that "there are circumstances in which it would be inappropriate for central banks 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)). 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 difficulty in defining clear procedures may be partly connected to the fact that the economic literature gives no clear guidance in this respect. The literature on the effectiveness of interventions leads to differing conclusions, based on which channel of their transmission is emphasised. With regard for example to 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 also be justified by the fundamental difference in the central bank's 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 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 real-time might thus be damaging.⁹

Let me now look at the communication of foreign exchange interventions in the Czech Republic. At times, the fact that the CNB was intervening was announced immediately (eg on 31 March 1998, 4 October 1999, 21 January 2002, or most recently 10 April 2002; see Table 3), but on other occasions the CNB carried out "undisclosed" interventions (eg in December 2001 or in July-September 2002). Discussions of 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, did the minutes also include clear information on interventions. This happened either in the case of extraordinary meetings called due to exchange rate developments (such as on 21 January 2002 or 11 July 2002) or after some regular meetings (eg 4 October 1999,

⁸ Note that this credibility aspect is exactly opposite to what has been suggested by Mussa (1981). He has argued that the possibility of a 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.

⁹ It might still be possible and advisable, though, to publish the Board discussions with rather a long time lag for the sake of accountability.

30 March 2000, and 25 October 2001). But information on the voting ratio was given only in some of those cases, when the decision was unanimous.¹⁰ 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 3
Communication of interventions

Starting month	Final month	Short description
02/1998	04/1998	Open interventions on 31 March announced by a press release (but some 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), intervention volumes are published only by 25 percent of all central banks that responded to questions in a survey concerning the transparency of their intervention policies. 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 thus be 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 interest rate decisions.

6. Summary and conclusions

In this note, I discussed the role of foreign exchange interventions in the Czech inflation targeting regime. Since May 1997, the Czech Republic has operated a managed floating exchange rate with the euro (previously the Deutsche mark) serving as a reference currency. In line with that, the CNB has

¹⁰ 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 intervention debates from these meetings will also become public. Nevertheless, the transcripts are produced only from those meetings at which interest rate changes are discussed.

intervened occasionally in the foreign exchange market. With the exception of the year 1997, the interventions were directed against the koruna'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 euro 4.2 billion directly from the state. The agreement includes the government's participation in 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 two or three months. However, no particular, "ideal" intervention strategy can be identified at first sight. Something that worked in one situation may have little effect in another. 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 (altogether roughly euro 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 for foreign exchange interventions, which however implies a rather unstable transmission between central bank actions and market reactions. The strategy that worked in the second half of 2002, for example, cannot be thought of as a universally effective recipe for any future turbulent period.

An important aspect of the interventions that must not be overlooked is sterilisation costs. I have shown that these have indeed had a strong empirical relevance in the Czech Republic. Their volume since 1993 has been considerable, partly as a heritage of the fixed exchange rate regime till May 1997 and partly due to 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 the eurozone became negative and the interventions started to be viewed as profitable by the market.

Another issue that has often been overlooked by the literature on managed floating is the difficulty in defining clear procedural rules for 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 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.

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Foreign exchange market operations: the recent experience of Hong Kong

Peter Pang¹

Introduction

This note reviews the experience of the Hong Kong Monetary Authority (HKMA)'s foreign exchange market operations under the currency board arrangement since September 2003. During this period, the Hong Kong dollar (HK\$) exchange rate against the US dollar (US\$) experienced some unusual movements relative to the pattern in recent years. After staying very close to the level of HK\$ 7.8 per US dollar for a number of years, in late September 2003 the Hong Kong dollar appreciated against the US dollar. The exchange rate at one point reached HK\$ 7.7050 per US dollar, about 10 basis points (or 1.23%) away from 7.8. To stabilise the exchange rate, the HKMA purchased US dollars against Hong Kong dollars from banks, which resulted in a sizeable increase in interbank liquidity and led interbank interest rates to fall below US dollar interest rates. During the spring of 2004, the Hong Kong dollar exchange rate weakened gradually and reached the 7.8 level at which the HKMA stands ready to sell US dollars for Hong Kong dollars in response to requests from banks. More recently, since early October 2004, there has been renewed appreciating pressure on the Hong Kong dollar.

The recent episode of appreciation pressures on the Hong Kong dollar raises some interesting issues. What are the main factors that have contributed to the strong inflows of funds into the Hong Kong dollar? How has the HKMA conducted market operations to stabilise the exchange rate under the currency board arrangement? What are the implications of these operations on domestic monetary conditions and therefore the wider economy? To address these questions, the next section provides a brief description of the currency board arrangement in Hong Kong. Section 2 summarises recent market developments and considers factors that may have contributed to the upward pressures on the Hong Kong dollar, including a weakening of US dollar against other major currencies, market speculation about a revaluation of the renminbi, and improvements in economic conditions in Hong Kong. Section 3 outlines some policy considerations, including the HKMA's strategy for market operations, and implications for monetary and financial conditions in Hong Kong. Section 4 concludes.

1. Hong Kong's currency board arrangement

The monetary policy framework in Hong Kong is that of a currency board, under which the Hong Kong dollar is linked to the US dollar at a rate of 7.8 (hence the Linked Exchange Rate System). Under this system, the HKMA seeks to stabilise the Hong Kong dollar/US dollar exchange rate by buying and selling Hong Kong dollars on bank offers in the face of capital outflows and inflows. Foreign exchange market operations by the HKMA lead to changes in banks' clearing balances held with the HKMA (the aggregate balance). As a result of changes in the interbank liquidity, which is a key element of the monetary base, interbank interest rates will move in the direction that is conducive for a reversal of fund flows. The interest rate arbitrage activity is a key part of the automatic adjustment process that maintains exchange rate stability.

Currency board principles require that changes in the monetary base can only be brought about by corresponding changes in foreign exchange reserves. Thus, operations by the currency board in the foreign exchange market can have immediate impact on domestic monetary conditions, and no sterilisation is allowed. Under normal conditions, interest rates in Hong Kong would follow closely those in the US, due to interest rate arbitrage activity. However, when there are strong inflows or

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outflows of funds, Hong Kong dollar interest rates can deviate substantially from their US dollar counterparts.

As to the exact level of the exchange rate at which the HKMA is committed to buy and sell Hong Kong dollars, the current system involves an asymmetric arrangement. Specifically, the HKMA undertakes to convert banks' Hong Kong dollar clearing balances to US dollars at the rate HK\$ 7.8/US\$ when there are pressures on the weak side.² When this so-called "convertibility undertaking" (CU) is triggered, the Aggregate Balance will contract, leading to an increase in domestic interest rates. By contrast, the HKMA does not announce an explicit exchange rate at which it will stand ready to convert US dollars to Hong Kong dollars, although it is clear that it will undertake HKD sales if the exchange rate strengthens materially from 7.8. The absence of such a "strong-side" undertaking implies that the HKMA can determine at which level and under what circumstances it will accept offers from banks to purchase US dollars. This gives the HKMA some very limited technical discretion. It is noted that the absence of an explicit CU on the "strong side" is well-known among market participants and has been discussed publicly on a number of occasions by the HKMA.³ The rationale of this arrangement is set out in Section 3.

The HKMA tries to keep its market operations as simple and easily understandable as possible. The HKMA conducts its foreign exchange operations only in the spot Hong Kong dollar market across different time zones, and as noted above, all currency board transactions are unsterilised. The HKMA has been disclosing the records of discussion of the Exchange Fund Advisory Committee's (EFAC's) subcommittee on currency board operations since November 1998 to promote public understanding of its market operations.⁴ Immediately after the completion of market operations, the HKMA releases real time data on its net injection or withdrawal of funds in the interbank market and the corresponding forecast changes in the aggregate balance via Reuters contribution page. This measure enables market participants to anticipate changes in interbank liquidity and facilitates a more efficient adjustment in interbank interest rates. Moreover, detailed information on the monetary base and interbank liquidity are released daily on the HKMA website and its Reuters page.

2. Recent market developments and HKMA's operations

In late September 2003, the Hong Kong dollar appreciated against the US dollar, and reached an intraday high of HK\$ 7.705 to the US\$ in early October 2003. This marked a deviation from the usual trading range of 7.797 and 7.8. Under the currency board arrangements, the HKMA carried out 104 strong-side operations, at which it sold Hong Kong dollars for US dollars, between 23 September 2003 and 10 February 2004. A total of HK\$ 54.17 billion was sold by the HKMA during this period.

Chart 1 shows the Hong Kong dollar spot exchange rate during this period together with the HKMA's strong-side operations, as well as the operations conducted as a consequence of the exchange rate reaching the CU. It shows that the level of the exchange rate at which strong-side operations take place vary over time. For instance, while such operations in 2002 were conducted at levels above 7.79, during the episode under consideration they typically took place between 7.75 and 7.77. Since October 2004, strong-side operations have typically been conducted at levels above 7.75. It is noted that under normal market conditions, strong-side operations are conducted in a passive manner. However, when there are strong inflows or when the exchange rate strengthens sharply, a more proactive approach is desirable (see below).

² Following the massive speculative attack in August 1998, a number of changes to the currency board mechanism, the "seven technical measures", were adopted in September 1998. Among these was the announcement of an explicit CU by the HKMA to banks to convert on request Hong Kong dollars to US dollars at the fixed rate of 7.75, which served to put a limit on the exchange rate on the "weak side". It was subsequently decided that the CU would be shifted gradually from 7.75 to 7.8 by HK\$ 0.0001 per day over the period from 1 April 1999 to 14 August 2000, in order to bring the CU rate in line with the official linked rate of 7.8.

³ Joseph Yam (2004).

⁴ The subcommittee was established in 1998 as part of the reform package to strengthen the currency board arrangement. It convenes on a regular basis to review Currency Board Operations and considers related policy issues.

In accordance with currency board principles, the sales of Hong Kong dollars by the HKMA were matched by corresponding increases in the aggregate balance, which rose to an unprecedented level of HK\$ 54.54 billion on 18 March 2004. Chart 2 plots the daily aggregate balance, with the period from late September 2003 to early February 2004 highlighted. In the 12 months preceding this episode, the average level of the aggregate balance was HK\$ 370 million. Thus, interbank liquidity rose much beyond what banks previously had required for interbank payment purposes.

Chart 1
Strong-side operations and the triggering of the CU

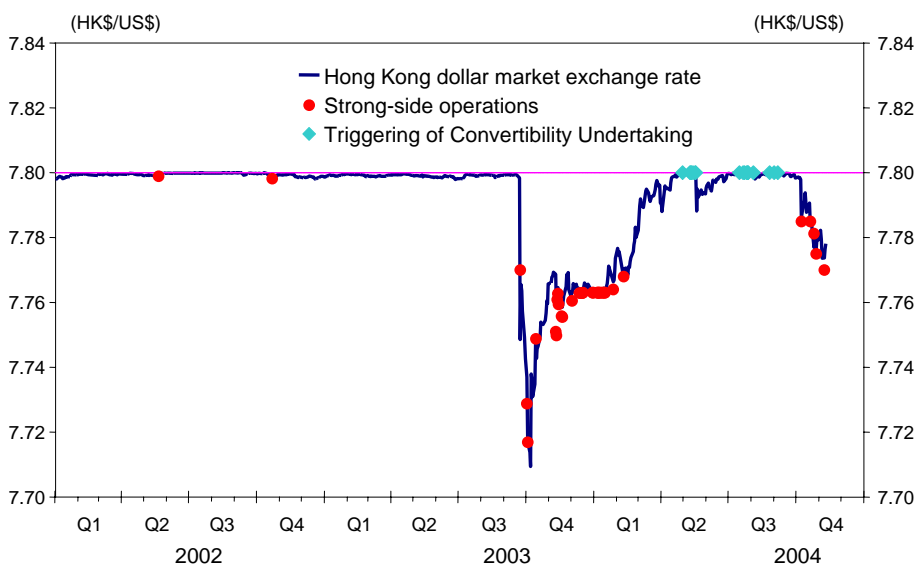
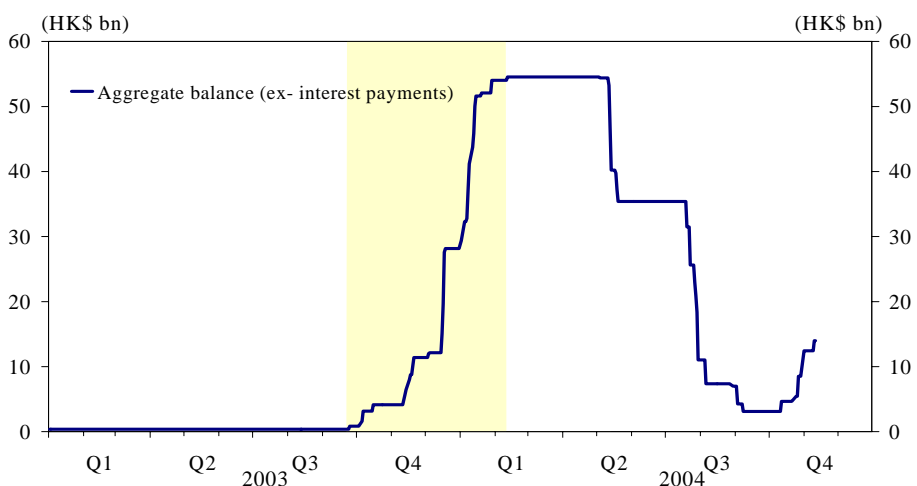
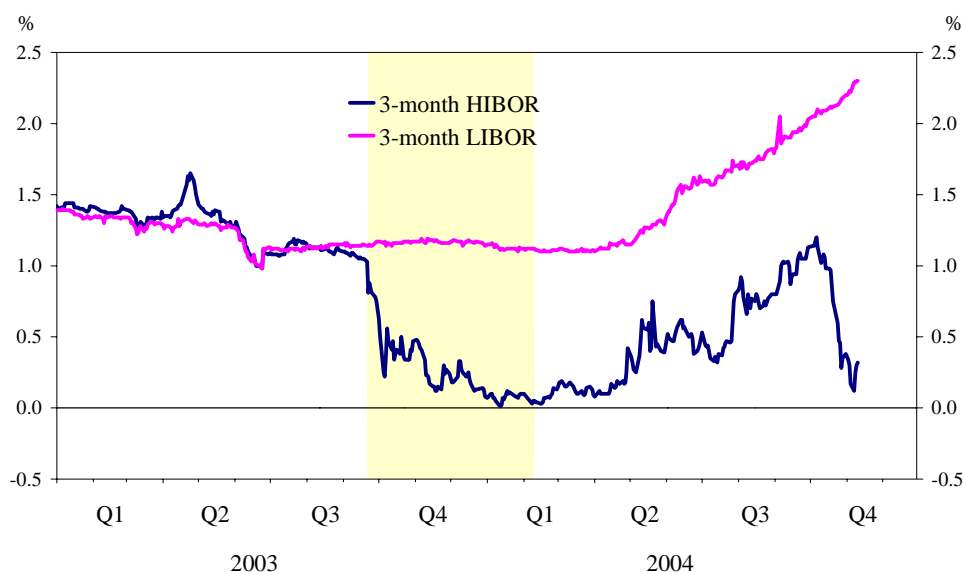


Chart 2
Aggregate balance



With ample liquidity in place, Hong Kong dollar interest rates fell, especially at the shorter end of the yield curve. In particular, the overnight HIBOR declined quickly to near-zero levels between late September and early October 2003, and remained at those levels until late August 2004. Chart 3 shows the level of the 3-month Hong Kong dollar and US dollar interest rates, with the same period highlighted as in Chart 2. While the US dollar rate was stable at a level somewhat above one percent, the Hong Kong dollar rate fell sharply towards zero.

Chart 3
HK\$ and US\$ interest rates



During the spring of 2004, signs of capital outflows appeared and the Hong Kong dollar depreciated towards the 7.8 level. Between late April and the end of September 2004, the CU was triggered repeatedly, causing the HKMA to purchase some HK\$ 51.45 billion from the market. Interbank interest rates rose along with the US interest rates, reflecting the monetary tightening by the US Federal Reserve. However, there was renewed appreciation pressure on the Hong Kong dollar exchange rate in October 2004, prompting the HKMA to conduct a number of strong-side operations by selling HK\$ 10.9 billion to the market, leading to matched increases in the aggregate balance. As a result, Hong Kong dollar interbank interest rates fell to near-zero levels again, increasing the negative spreads against US rates.

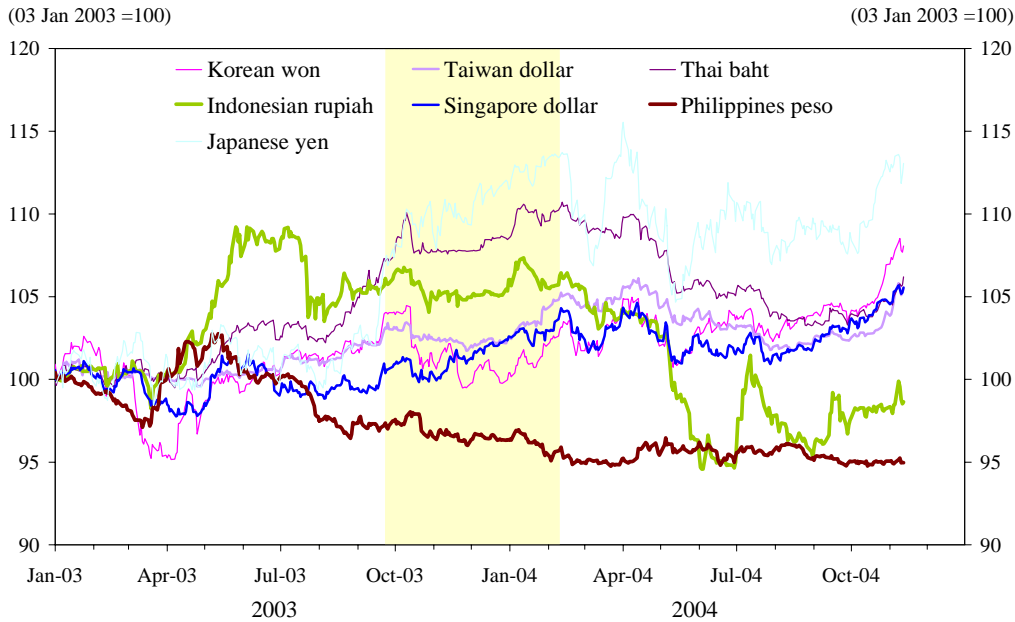
Both external and domestic factors may have played a role in the strengthening of the Hong Kong dollar exchange rate in this episode. These include a weaker US dollar, speculative pressures for an appreciation of the renminbi and improved economic conditions in Hong Kong. In addition, market dynamics including an unwinding of Hong Kong dollar short positions is likely to have played a role as well.

Weakened sentiment towards the US dollar

The strong inflows of funds took place against the background of market concerns about the sustainability of the current account deficit in the US and a weak US dollar. Moreover, the US administration had been calling for more exchange rate flexibility, especially on the part of its major trading partners in Asia. The G7 communiqué issued on 20 September 2003 reiterated this position, leading to market expectations of a depreciation of the US dollar against Asian currencies. Chart 4 illustrates that most of the Asian currencies that floated, particularly the yen, appreciated against the US dollar in this period.

Chart 4

Exchange rates of Asian currencies against the US\$



The G-7 statement led to renewed speculation that the renminbi would be revalued and the discount of the renminbi in the non-deliverable forward (NDF) market widened markedly. Chart 5 shows the renminbi /US dollar NDF rate and the size of the HKMA's foreign exchange operations. Positive values denote the amount of Hong Kong dollars sold by the HKMA for US dollars on the strong side and negative values denote the amount of Hong Kong dollars purchased by the HKMA as a consequence of the exchange rate reaching the 7.8 limit. Chart 6 provides a similar comparison between the Japanese yen/US dollar spot exchange rate and the HKMA's market operations. These two charts indicate that strong-side operations, which were prompted by inflows of funds, were associated with a sharp widening of the 12-month renminbi NDF points as well as the weakening of the US dollar against the yen. The subsequent triggering of the CU due to outflows took place when the yen exchange rate and renminbi forward points reversed markedly.

There are a number of explanations for why the weaker US dollar and upward pressures on the renminbi led to inflows of funds into Hong Kong. First, the weaker US dollar, to which the Hong Kong dollar is linked, implies a depreciation of the Hong Kong dollar against other major currencies including floating Asian currencies. This improves Hong Kong's external competitiveness and thus the economic outlook, which in turn increases the potential return on Hong Kong assets. Because the renminbi is also pegged to the US dollar, Hong Kong could also benefit from an increased intermediation of exports originating from Mainland China. Second, the speculative pressures on the renminbi attract inflows into Hong Kong dollars, because some Hong Kong dollar denominated assets, including H and red-chip shares listed in Hong Kong, would benefit from a higher valuation should the renminbi appreciate. Furthermore, some market participants perceive a link between the Hong Kong dollar and the renminbi given the increasing economic integration between the two economies and the stable exchange rate between the two currencies in the past decade. Thus, they expect that a change in the renminbi exchange rate regime will also lead to a change in the Hong Kong dollar exchange rate system (even though this is ungrounded speculation).

Chart 5

Renminbi non-deliverable forward points and market operations

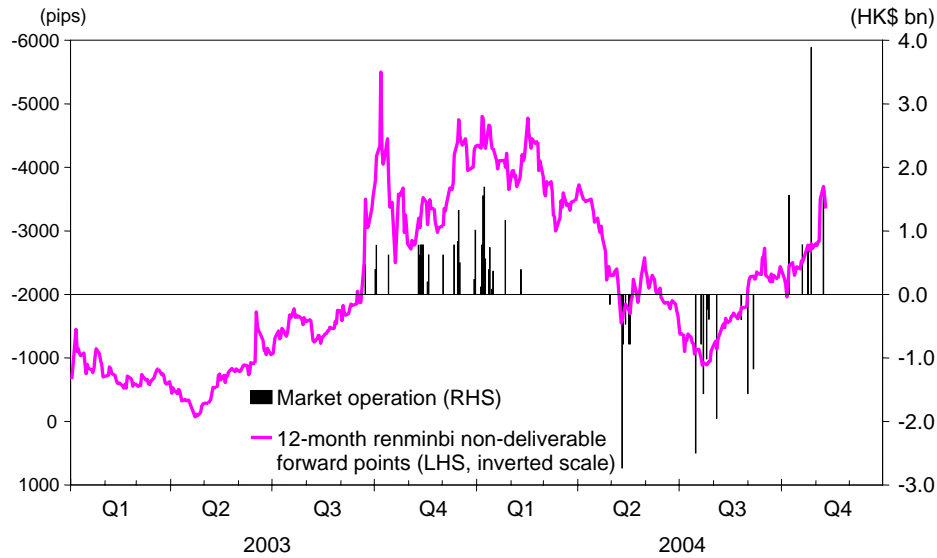
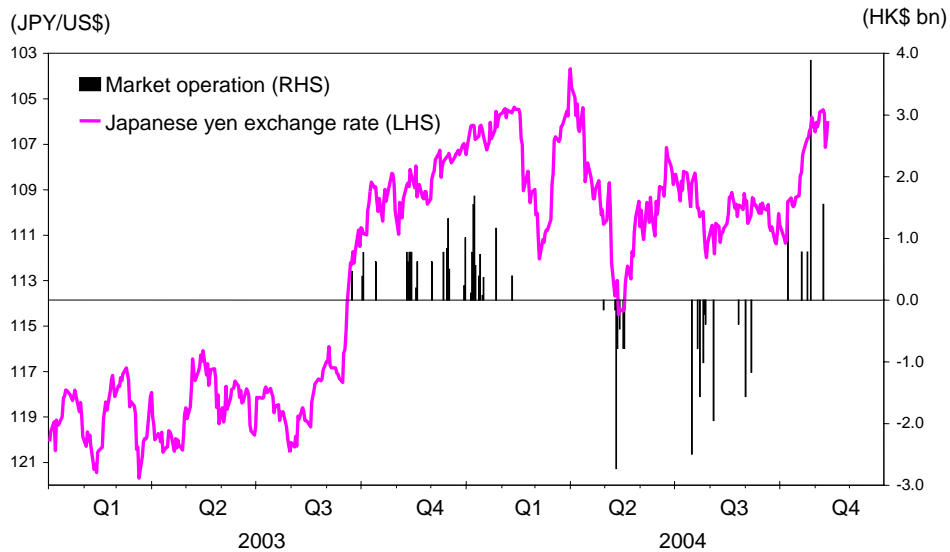


Chart 6

The YEN/US\$ exchange rate and market operations



Improved economic conditions in Hong Kong

The second factor was the marked improvement in economic conditions and in the growth outlook for Hong Kong. Several favourable developments appear to have played a role, in particular the strengthening of global economic conditions, the conclusion of a Closer Economic Partnership Agreement (CEPA) with the mainland, and the mainland's relaxation of restrictions for mainland visitors travelling to Hong Kong. Along with the recovery in economic growth, the unemployment rate, which peaked in August 2003 at 8.7%, started declining and reached 6.9% in July 2004, and there were signs that deflation was coming to an end. In particular, following a number of years of sharp decline after the burst of the bubble in 1997, property prices started to rebound from the summer of 2003.

A recent study by Gerlach, Ho and Leung (2004) finds that pressures on the Hong Kong dollar were mainly determined by the yen/US dollar exchange rate and the 12-month renminbi NDF point, rather than domestic economic variables.⁵ This suggests that external factors played a more important role in explaining the inflows of funds in this episode. Furthermore, there is a clear systematic component in HKMA's strong-side operations. In particular, the likelihood of strong-side operations increases with the spreads of the Hong Kong dollar overnight interest rate over its US dollar counterpart, and decreases with the level of the aggregate balance and 12-month Hong Kong dollar forward rate.

Market dynamics: an unwinding of Hong Kong dollar short positions and limited interest rate spreads

In addition to the economic factors noted above, market dynamics have also likely played a role. The abrupt appreciation of the Hong Kong dollar at the beginning of the period considered led to an unwinding of Hong Kong dollar short positions, some of which had been entered into by market participants to hedge against the perceived risks of depreciation of the currency. This probably exacerbated the movements of the Hong Kong dollar. It is noted that banks' net US dollar open position rose to about HK\$ 94 billion by end-July 2003 from HK\$ 60 billion two years ago, but declined in the episode of appreciating pressures to HK\$ 46 billion by end-July 2004.

More generally, the private sector of the Hong Kong economy has accumulated a large amount of net foreign assets, part of which reflects increased savings and limited investment opportunities in Hong Kong during the economic downturn. This is evidenced by the large current account surpluses in the past few years, which reached a high level of over 10% of GDP in 2003. Improved sentiments towards the Hong Kong dollar and its denominated assets have probably caused some repatriation of funds back to Hong Kong.

Finally, interest rate arbitrage activity, which is a key element of the automatic adjustment mechanism under the currency board arrangement, has probably not functioned effectively, because of limited spreads between Hong Kong dollar and US dollar interest rates. This is because US interest rates were at low levels of about 1% pa until recently (still low relative to historical standards, despite the increases in the past few months), and Hong Kong dollar interest rates could not fall below zero. As a result, the strong-side operations could not lead to the development of an interest rate spread sufficiently large to induce outflows.

3. Operation strategy and policy considerations

The strength of the spot exchange rate relative to the linked rate of 7.8 has led some market participants to question the merits of not having an explicit CU on the strong side. It is argued that the HKMA could have maintained the spot exchange rate at a level close to 7.8 by committing to buy US dollars at that level on an unlimited basis. Such an explicit CU would help anchor exchange rate expectations, which should facilitate interest rate arbitrage activity. With expectations of zero change in the exchange rate, even a small interest rate differential should induce an outflow of funds.

It is noted that policy issues concerning strong-side operations have been considered by the currency board subcommittee of the Exchange Fund Advisory Committee on a number of occasions in recent years. The subcommittee is fully aware of the potential benefits and costs of an explicit CU on the strong side. In particular, it is recognised that well-defined and narrow margins for movement in the market exchange rate would increase the predictability and transparency of the system, and thus conceptually would be more congruous with the currency board's objective of providing a firm exchange rate anchor. However, a number of considerations point to potential costs of an explicit strong-side CU. The subcommittee considers that, on balance, the current arrangement is appropriate.

The most important consideration is that the absence of an explicit CU makes it difficult for speculators to calculate the cost of shorting the Hong Kong dollar, as they do not know the precise rate at which Hong Kong dollars could be bought back to square their positions. Thus, the possibility of a small

⁵ Stefan Gerlach, Daryl Ho and Frank Leung (2004).

appreciation of the Hong Kong dollar helps reduce the downward speculative pressures. In this respect, it is noted that it is more difficult to defend a fixed exchange rate on the weak side than on the strong side. On the weak side, a monetary authority's ability to purchase the domestic currency is limited by the size of foreign exchange reserves. The resulting high interest rates depress the economy, and could even threaten financial stability, reducing the political acceptance of maintaining the fixed exchange rate. On the strong side, the monetary authority could buy the US dollar on an unlimited basis by creating Hong Kong dollar liquidity. While the resulting zero interest rate may lead to overheating pressures in the economy, the impact is generally viewed to be more benign than that of high interest rates. Thus, the ambiguity on the strong side is "constructive" in that it helps to redress this asymmetry. By sacrificing a bit of transparency on the strong side, which is relatively easy to defend, it increases the resilience of the system to weak-side pressures, thereby improving the sustainability of the system as a whole. A recent IMF study presents a theoretical model showing that under certain circumstances some ambiguity on the strong side of the linked exchange rate is optimal, because it improves the credibility and resilience of the whole system.⁶

Next, by providing some scope for the exchange rate to strengthen in response to capital inflows, it helps absorb pressures and reduce, albeit on a limited basis, the impact on interbank interest rates and reserves. Moreover, an explicit CU with a tight bid-offer spread would not be conducive to the development of a liquid foreign exchange market. Instead of dealing with one another, banks would choose to transact with the HKMA when the bid-offer rates are hit.

In the absence of an explicit CU on the strong side, the HKMA exercises discretion in choosing the precise level of exchange rate at which to sell Hong Kong dollars, taking into consideration the prevailing market conditions. In general, strong-side operations are passive in nature, in that the HKMA responds to bank offers of US dollars at market rates instead of placing out orders in the foreign exchange market. However, a more proactive approach is adopted on occasions when there are strong speculative inflows or when the exchange rate strengthens sharply. This is because banks taking a speculative long position in the Hong Kong dollar have a disincentive to sell US dollars to the HKMA, as the transaction would lead to an increase in interbank liquidity, followed by an easing of interest rates and the exchange rate. To the extent that they constitute a significant force in the market, the exchange rate may strengthen sharply, while banks remain reluctant to approach the HKMA. Under those circumstances, placing an order in the market would be more effective in capping the exchange rate movement, and ensuring that the interest rate adjustment mechanism kicks in when the exchange rate hits the "intervention" rate.

As currency speculation would invariably be associated with rumours about the government's resolve to maintain the link, the "intervention" rate should be set close to 7.8 to remove market uncertainties. This has indeed been the case, although the HKMA has not fixed an implicit target or tolerance level for strong-side operations. Looking forward, systematic operations by the HKMA on the strong side should help anchor the exchange rate. Interest rate arbitrage activity will also be helped by a widening of interest rate spreads, as the US Federal Reserve is generally expected to raise the federal funds target rate further.

Finally, it is noted that currency board operations affect domestic monetary conditions to the extent they change interest rates, and that in the face of capital inflows, the impact would be capped because interest rates have a zero bound. Unlike most other systems, the aggregate balance can only be changed through foreign exchange transactions with the HKMA, and banks cannot withdraw balances with the HKMA to fund lending. In this episode, the impact of near zero interest rates on economic and financial conditions has not been a major concern. This is because the Hong Kong economy is still at an early phase of recovery. It has just emerged from a prolonged period of deflation, and the demand for credit remains subdued. Property prices have increased markedly, but this represents a rebound from a low level following sharp falls in earlier years.

⁶ See Paul Gruenwald (2004).

4. Conclusions

This paper reviews the recent experiences of the HKMA's operations in the foreign exchange market. It considers factors underpinning the strong inflow of funds in the latter part of 2003 and the more recent period since October 2004. These include weakened sentiments towards the US dollar, speculations about a renminbi revaluation and an improved outlook for the Hong Kong economy. Furthermore, market dynamics has probably exacerbated the upward pressures on the Hong Kong dollar. Some investors had previously accumulated large Hong Kong dollar short positions that took some time to unwind. Interest rate arbitrage activity was probably limited by the small Hong Kong dollar/US dollar interest rate spreads.

The note also outlines policy considerations in relation to the absence of an explicit CU on the strong side of the linked exchange rate. The current arrangement is considered optimal mainly because the constructive ambiguity on the strong side helps deter speculative pressures against the Hong Kong dollar on the weak side. In choosing the exact level of the exchange rate to sell the Hong Kong dollar, the HKMA has mainly responded to bank offers of the US dollar in a passive manner. Nevertheless, when there are strong speculative pressures or the exchange rate appreciates sharply, a proactive approach is adopted to counter possible strategic behaviour of large market players, and to provide an anchor for the exchange rate.

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Defending the strong side of the band - the Hungarian experience

Zsolt Érsek

1. The Hungarian foreign exchange regime

According to the Central Bank Act of 2001, the government and the central bank (MNB) mutually decide on the parameters of the exchange rate regime. The current Hungarian exchange rate regime, considering its main characteristics, is compatible with the ERM-II regime, in which every country aiming to join the EMU has to participate for at least two years before introducing the euro. The central parity, which is pegged to the euro, is 282.36 forint/euro. The market exchange rate may deviate from the parity within the +/-15% fluctuation band. The edges of the band are defined by the 324.71 forint/euro and 240.01 forint/euro exchange rate levels.

The present foreign exchange regime was introduced in three steps in 2001. On 4 May the fluctuation band was widened to +/- 15% from the earlier +/- 2.25%. On 15 June full foreign exchange liberalisation was announced. The crawling devaluation of the forint fluctuation band was lifted on 1 October and the central parity was set at 276.1 forint/euro. Since then there has only been one change: on 4 June 2003 the central parity (together with the whole band) was moved by 2.26%.

The bank distinguishes between passive and active intervention. Passive intervention means that at the edges of the band the MNB buys or sells foreign exchange to prevent the further appreciation or depreciation of the forint. This operation is implemented as standing facility, meaning that at the edges of the band the eligible banks call the MNB and ask for a price. The central bank's policy is to refrain from active intervention and use it only under extreme circumstances to decrease excessive volatility arising from insufficient liquidity. The main tool to influence the exchange rate is adjusting interest rates.

Until now, the market has reached the edge of the band only once, in January 2003 – but it resulted immediately in heavy speculation and attack against the strong edge of the band. At that time over five billion euros were bought by the Bank in passive intervention at the strong edge of the band. The speculation collapsed in two days, but the normalising the situation took longer and needed prolonged central bank intervention activity inside the band.

This paper will describe in detail the events from January until May 2003 (the speculative attack and the eventual outflow of hot money), concentrating on the several forms of central bank market presence at the time.¹

2. Economic background of the January 2003 attack

In 2002, two of the major factors affecting inflation, fiscal policy and wage policy, departed considerably from the path anticipated earlier that year. The demand generated by general government increased by more than 4% of GDP, which was significantly higher not only than the figures forecast in early 2002, but also the projection in the government's mid-term economic programme in August 2002.

¹ The MNB published detailed analyses of the events in its 2003/3 MNB Background Studies "Coping with the speculative attack against the forint's band" (see: www.mnb.hu/publications). This paper is partly based on this study.

During the autumn of 2002 it became obvious that fiscal expansion and the rate of wage growth would be significantly higher than what was forecast in August. Thus, the exchange rate comfort zone earlier announced of 240-245 forint/euro seemed to be inadequate to meet the inflation target. Given the situation, the MNB did not intend to prevent forint appreciation by interest rate policy, as both the modified 2003 inflation target and the one set for 2004 required an exchange rate very close to the edge of the forint's intervention band. That is why the MNB cut the base rate only twice by 50 basis points (19 November and 17 December) each time.

The appreciation of the forint's exchange rate after 19 October (the Irish referendum on EU enlargement) was caused by foreign investors' increased demand for long-term government securities (convergence trades).²

Simultaneously with the appreciation of the exchange rate, pressure was building up on the bank to considerably reduce its key policy rate. Many called for the abandoning of the inflation targets or at least their repeated modification. Under the circumstances, a massive interest rate cut would have undermined the credibility of the inflation targets and jeopardised the process of disinflation through generating higher inflationary expectations. In stark contrast, the MNB's interest rate policy unequivocally evidenced the central bank's commitment to the process of disinflation, which was especially crucial in December 2002 and January 2003, a period of utmost importance in terms of price and wage processes.

Nevertheless, no amount of speculative capital flowed in until 15 January. After the MNB's interest rate cut on 17 December, the amount of government securities held by foreign investors had stopped increasing, with the forint's exchange rate stabilising near the strong edge of the band. Due to Hungary's approaching entry into ERM-II, certain market participants forecast that the exchange rate would already be stronger than the edge of the band for the final months of 2003; however market developments did not suggest any short-term speculation on the appreciation of the forint.

On 15 and 16 January, however, the central bank had to face the challenge of extremely heavy speculation on the appreciation of the forint. Within the span of two days the MNB had to purchase a considerable amount of euros, totalling 5.3 billion, owing to massive forint purchases by foreign speculators.

3. Intervention techniques used

During the attack and its aftermath the MNB used several different intervention techniques (and other policy measures) to fend off the attack and reinstate normal market conditions.

3.1. Intervention at the edge of the band (passive intervention)

On 15 January 2003 the exchange rate of the forint reached the edge of its trading band (see Chart 1). The MNB had to buy a total of euro 908 million at 234.69 forint/euro. The foreign exchange transactions statistics submitted regularly by resident commercial banks to the MNB revealed that large forint buying orders had been placed by eight major foreign banks, many of which have subsidiaries in Hungary. The speculative attack was mounted by these foreign banks, or rather the clients they represented. On the same day, an extraordinary meeting of the monetary council cut the base rate by 100 basis points effective from the following day.

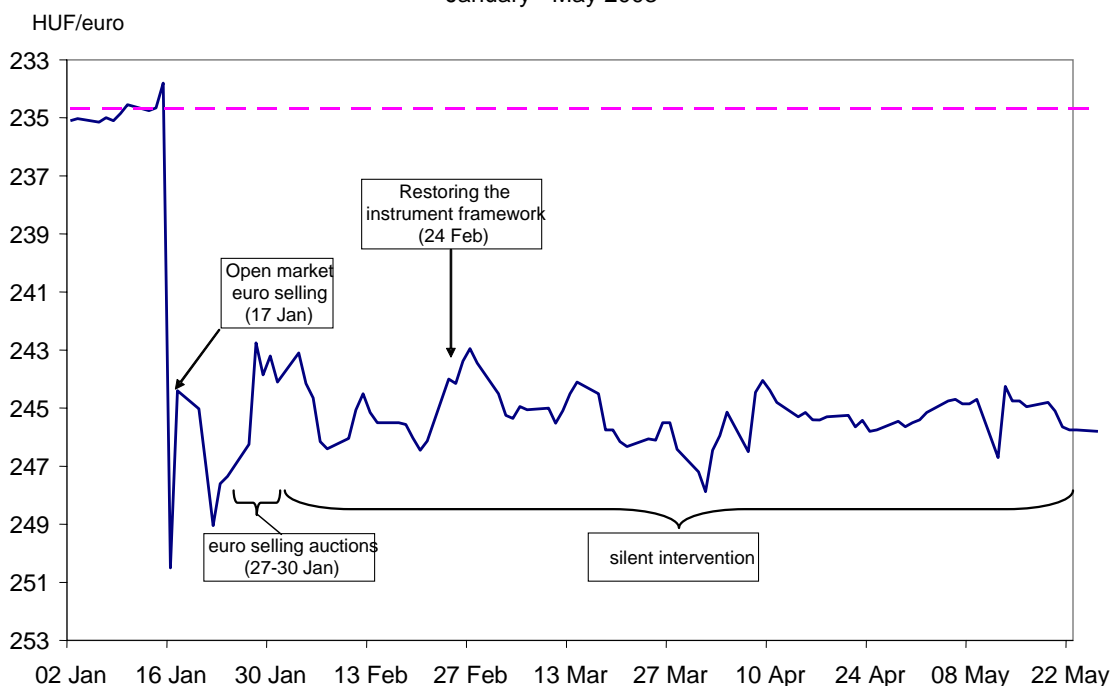
Market participants are likely to have interpreted the MNB's move as the sign of an imminent shift in the band. Some even voiced their opinion that a shift in the band was imminent as early as the following morning, which is evidenced by the fact that after the MNB's trading hours (15.00 GMT), with a completely unusual turnover for this time of the day, the market rate of the forint abandoned the band, and in the evening transactions were concluded at a rate below 233 forint/euro. The attack proved that important information – broadly available to the market – escaped the speculators'

² These convergence trades exploit the fact that, by countries entering the eurozone, the differences among the yield curves of the countries should be much smaller due to the disappearance of currency risk.

attention. According to the Central Bank Act, “the Government, in agreement with the MNB shall determine the exchange rate regime, and all parameters thereof, in particular the width of the fluctuation band, the central parity and the composition of the currency basket”. Moreover, the government voiced its opinion on several occasions that it deemed the appreciation of the forint excessive. Being aware of all the above facts, one could hardly have thought realistically that a shift in the band, resulting in the possible further appreciation of the forint, would occur.

Chart 1

Florint/euro exchange rate and euro sales by the MNB
January - May 2003



On the second day (16 January), the MNB had to intervene in an amount of euros 4.371 billion. At a press conference, the governor denied news reports on both a shift in and abandonment of the band and said that in order to defend the exchange rate regime the Bank was willing to further slash interest rates. This somewhat eased pressure on intervention, but it was unable to put an end to it. Major forint buyers were the ones who had already been active the day before, mostly the London subsidiaries of large international investment banks. Intervention at the strong edge of the band during the two days totalled euro 5.3 billion, equal to 7% of GDP in 2003.

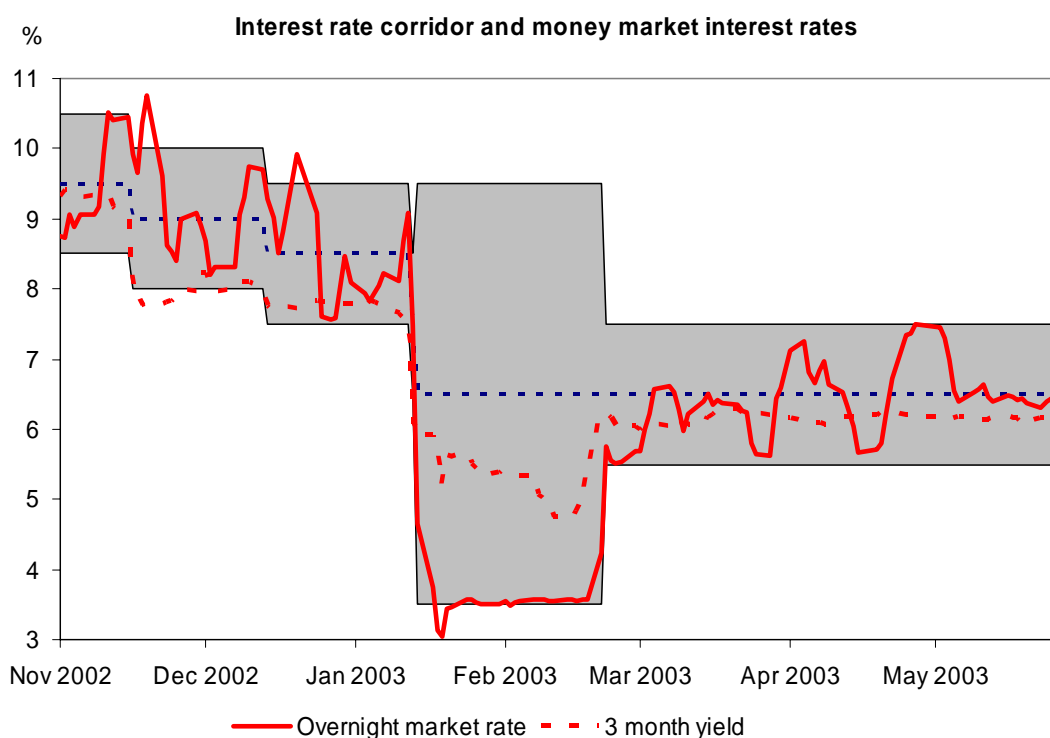
On 16 January, the monetary council took several steps to defend the exchange rate band. It lowered the key interest rate by another 100 basis points, put restrictions on the quantity of two-week deposits (forints 100 billion) and widened the overnight (O/N) interest rate corridor from +/-1% to +/-3% (see Chart 2).

Cutting the key interest rate on its own would not have resulted in the numerous advantages of the measures taken. As the engine of speculation had been expectations of the abandonment of the exchange rate regime, it was impossible to calculate the extent of necessary interest rate cuts. It was obvious that for a transitory period, deep interest rate cuts would be necessary to put an end to speculation and force the bulk of the hot capital to exit the market. Therefore the MNB decided to separate the permanent part of the interest rate cuts from the temporary: it would lower its key interest rate by 1%. However, the yield that the speculative capital would be able to post would decline by over 3% relative to the key rate. The 6.5% key interest rate continued to reflect the central bank's preferred interest rate level after the speculative attack, and was clearly different from the one on the O/N deposit facility. As a result, no extreme fluctuation of longer maturity yields or interest on deposits and loans materialised.

The MNB was able to absorb via domestic banks all excess liquidity in the banking system in O/N and two-week deposits. This resulted in a 5-percentage point decrease in actual yield at the short end (the most sensitive end in terms of speculation money) of the yield curve in two days. These measures, combined with the central bank's communication strategy committed to maintaining the exchange regime, reached their goals. Some speculators started to sell forint (ie close their positions), and further depreciation of the forint urged others to follow suit. By the end of the day, speculation had come to a halt, with the forint's exchange rate 5% weaker.

It is worth mentioning that these temporary changes in the monetary policy framework cannot be interpreted as use of capital controls, because neither were outright prohibition on capital flows implemented, nor were indirect controls introduced. The message sent to the speculators was that gains on forint purchases were far from being guaranteed, as they would only be able to place the purchased forint liquidity in deposits at an interest rate lower than the 3.5% rate on O/N deposit facility.³

Chart 2



3.2 Open market interventions

Intra-band euro sales had similar importance to previous changes to the central bank's policy instruments. The MNB recognised right from the beginning that the euro 5.3 billion was enormous compared with the size of the Hungarian foreign exchange market. In the absence of central bank intervention, the outflow of speculative capital would have caused the exchange rate to weaken to an extent, which could have led to the outflow of non-speculative capital as well.

Interventions in the foreign exchange market conducted after the speculative attack were fundamentally different from usual central bank interventions. Basically, the MNB sold euros for the purpose of handling a quantity problem – enormous amounts of speculative short-term forint assets were in the market relative to its size, which posed a substantial downward risk on the exchange rate. Due to the above considerations, the MNB attempted during the entire management of appreciation speculation not to give concrete price signals with the interventions to market participants.

³ Since only domestic banks have access to the MNB's standing facilities.

3.2.1 Classical open market intervention

The first intervention took place on Friday 17 January. On this occasion, the central bank conducted open market intervention through local brokers at the market rate in order to stabilise the market. Unfortunately the direct presence of the MNB reinforced market participants' beliefs that the exchange rate would appreciate considerably in a short time. In this operation the central bank was not able to sell big amounts without strengthening the exchange rate undesirably, but at least the market stabilised.

Therefore, so as to increase speculative uncertainty, the MNB decided to withdraw temporarily from the open foreign exchange market and switch to silent intervention. In line with the central bank's expectations, this resulted in slow exchange rate depreciation: once again the forint's exchange rate had depreciated to nearly forint/euro 250 by 22 January and, at the same time, the central bank could sell bigger amounts.

3.2.2 Non-conventional open market intervention

Nevertheless, the outflow of speculative capital took longer than expected, so the MNB decided to adopt an intervention technique never used before. From 27 January, the MNB called for euro bids for four consecutive days. Each time market participants could submit five different bids until 12 noon. The MNB notified each bidder about the result at 2pm. No maximum acceptable amount was stipulated, or any exchange rate level pre-announced (free auction).

On all auction days the trading pattern on the forint/euro market was the following: the market opened at a higher rate (246-247 forint/euro) but right after the announcement of the auction the forint started to strengthen and bids were submitted at rates at least 1-2 forint lower than the opening market rate, only to return to weaker levels by next day. So every time the central bank appeared, the market "ran away".

This sort of auction was an attempt by the central bank to establish a kind of open consensus about the close of outstanding open positions. It failed, as both the submitted amounts and exchange rates were far from expectations. Out of the euros 5.3 billion EUR purchased only a few hundred millions were sold. Two out of four auctions were entirely unsuccessful. Interestingly, the most successful auction relatively was the last, where the MNB announced that it would hold no more auctions.

In addition to that, the commercial banking sector heavily criticised the central bank's new intervention technique, especially the MNB's decision not to publish the aggregate result of the individual auctions in order to avoid sending any undesirable exchange rate signals. The results were communicated to the auction participants on a bilateral basis – similar to a normal OTC market transaction.⁴

3.3 Silent intervention

As indicated above, covert intervention started right after the first open interventions. However, for obvious reasons, these were suspended during the period of currency auctions.

Finally, (classical and non-conventional) open market interventions taught the MNB the lesson that the market had interpreted the central bank's announced foreign exchange sales either as a sign of its intention to strengthen the forint or as a sign of weakness, which did not contribute to the outflow of speculative capital.⁵ Therefore, after the foreign exchange auctions the MNB gave up the open euro sales, but went on with silent intervention. An important principal here was to follow the general OTC market rules and conventions. The MNB, as one of the OTC market participants, entered into foreign exchange transactions on a bilateral basis at the current market rate. Partners were domestic and international banks with set-up foreign exchange limits with the central bank. The deal size amounted

⁴ In reaction to the criticism the MNB organised a meeting with the Hungarian Forex Association where it explained its aims and motivations with the auctions. This was taken positively received by market participants.

⁵ The MNB considered the reduction of excessive speculative positions as a pre-condition to reinstate the pre-attack monetary policy framework.

from euros 10 to 230 million. The regular and long-standing presence of the MNB in the international foreign exchange market greatly helped build the channels of silent intervention.

Using these intervention techniques, by 24 February the MNB had sold approximately half of the 15-16 January intervention amount, allowing the central bank the possibility of restoring its instruments. On 24 February 2003, the monetary council passed a decision on restoring the monetary instruments to their state prior to the speculative attack. Accordingly, the interest rate corridor surrounding the central bank base rate was narrowed to $\pm 1\%$, and the quantity restriction on the two-week deposit facility was removed at the same time.

The market operations following the reinstatement of monetary instruments were primarily aimed at preventing the outflow of the remaining speculative capital from causing any excessive fluctuations in yields or the exchange rate. Therefore the euro sales also continued after the reinstatement of the instruments, but at a slower pace. While not aimed at influencing the forint exchange rate, the small amounts of currency sales allowed the winding up of speculative positions.

The MNB continued the silent intervention until 23 May, bringing the amount of euros sold at the market exchange rate to euros 3.8 billion. Of the euros 5.3 billion inflow of hot money arising from the central bank's intervention at the band edge, a further amount of approximately euros 1.2 billion was cooled off by means of market participants' (mainly exporters) hedging transactions. This enabled the MNB to declare that most of the capital associated with the speculation on appreciation had left the country. Therefore the MNB announced that from 26 May it would stop intervening within the band and return to its former strategy of using interest rate policy to control the exchange rate.

The combined interest rate and intervention measures, taken by the MNB to fend off the speculative attack, successfully cooled down expectations of a shift in the band. The speculators participating in the unjustified speculation in January 2003 had to post massive losses. Based on the MNB's calculations, they realised a total loss of approximately forints 60 billion (euros 240 million). The MNB realised exchange rate gains totalling forints 43 billion.⁶

4. Conclusions

The speculation failed partly because, in contrast to the experience of a number of emerging countries and previous ERM crises, this speculation was intended to force a revaluation of the domestic currency rather than its devaluation. Even though volume data on foreign exchange market products clearly show that the liberalisation of foreign exchange regulations potentially boosted speculators' power, this recent experience reveals that it is much more difficult to beat the central bank at the strong edge of the exchange rate band than at the weak edge.

This is partly because here intervention causes foreign currency reserves to increase, with no natural upper limit. Second, avoiding this kind of speculation needs a reduction in interest rates, which is, in the short term, significantly less worrying for the financial sector than a major rise in interest rates following speculation aimed at pressuring monetary authorities to devalue.

The other big lesson was that targeting a quantity, rather than an exchange rate level, means a considerably different challenge for the central bank. Experiences showed that under these circumstances covert intervention proved to be more successful than open foreign exchange market intervention.

Finally, it became clear that regular and long-standing presence in the international foreign exchange market can help greatly under such extreme market circumstances. Experienced dealers, well-established market information channels, existing foreign exchange dealing lines were crucial in the efficient management of the situation.

⁶ Interestingly, the Hungarian banking sector – which did not actively participate in the speculation – increased its earnings and showed an increase of over 50% in the sector's after-tax profit in 2003 Q1, relative to the corresponding period in 2002, partly due to the huge number of executed and processed transactions.

Foreign exchange intervention and policy: Bank Indonesia experiences

1997 - October 2004

1. Introduction

The foreign exchange market in Indonesia has been developing in conjunction with changes in the exchange rate regime, which has moved gradually toward increased emphasis on market mechanisms. Essentially, the foreign exchange system is evolving from tight government control towards a free foreign exchange system, while the exchange rate system is moving progressively from a fixed exchange rate towards a flexible exchange rate system, at a pace consistent with prevailing economic conditions.

Since the adoption of free floating in mid-1997, the experience of sharp and persistent depreciations of the rupiah, sudden short term capital outflows, and a fragile domestic financial sector collectively motivated structural changes in Indonesia's foreign currency market. Bank Indonesia, as stipulated in the Bank Indonesia Act, has implemented several policies to maintain exchange rate stability, including intensive monitoring of foreign exchange market transactions, moral suasion, foreign currency intervention in the domestic foreign exchange markets, and direct controls through relevant regulations.

Since Indonesia moved from managed to free floating on 14 August 1997, intervention has been used primarily as a liquidity management tool to offset government expenditures. At the same time, such interventions can also stabilise rupiah volatility, especially during rapid depreciations associated with excess liquidity. Thus intervention, through tightening domestic liquidity by the sale of foreign exchange, can be used as a framework to influence the exchange rate. As well as absorbing excess rupiah liquidity, intervention by way of selling foreign currency also aims at lessening the volatility of the exchange rate; easing market pressures; and by its nature, adding foreign currency liquidity into a market which is often marked by lack of supply.

This paper reviews the development of the rupiah during period 1997 to 2004 and explains the activities of Bank Indonesia in maintaining the stability of the exchange rate.

2. Foreign currency intervention

2.1 Overview

Just like other central banks, Bank Indonesia has the authority to carry out foreign currency intervention at both policy and operational levels. Foreign currency intervention policies are mainly intended to maintain exchange rate stability, particularly at times when there are factors that impact negatively on the rupiah. Nevertheless, foreign exchange intervention is only undertaken when moral suasion is ineffective in influencing market participants and curbing excessive exchange rate movements.

Internal Bank Indonesia guidelines and regulations that guide and constrain foreign currency intervention emphasise efficient implementation, taking into account factors such as market liquidity conditions, transaction turnover, and market psychology. The execution of foreign currency intervention policy is varied as regards both timing and magnitude, in order to avoid predictability. Intervention operations are conducted in a measured and careful manner, recognising the importance of foreign exchange reserve adequacy.

Supply and demand conditions in the foreign currency market are always taken into account. When appropriate, the sale of US dollars in the domestic foreign exchange market is structured so as to provide a resistance level for the currency, with the objective of reducing the probability of exchange rate movements beyond that level.

Bank Indonesia does not announce foreign currency intervention to the public, reserving to itself information regarding volume, strategy, and timing. However, Bank Indonesia will continuously and very closely monitor foreign currency transaction activities, either indirectly via on-screen figures and broker's information (off-site supervision), or directly (on-site supervision).

2.2 Transaction types

Under the existing law, Bank Indonesia has the right to conduct all types of foreign currency transactions for intervention purposes. Yet Bank Indonesia intervenes mainly through spot transactions which dominate the domestic foreign exchange market. The choice of spot transactions for intervention relates to factors such as:

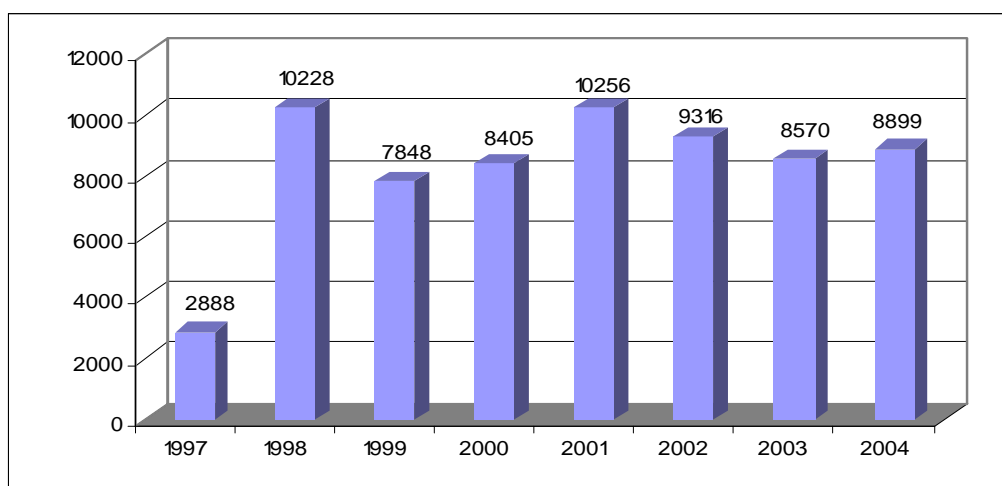
- The volume of spot transactions is relatively large in the domestic market.
- Spot transactions have the potential to influence price movement immediately.
- Spot transaction patterns can indicate speculative market behaviour.
- Spot transaction volumes can reflect the volatility of the exchange rate. For example, spot transaction volumes are almost in line with rupiah volatility, so they can be used as consideration in the decision to intervene.

2.3 Timing and magnitude

Given that maintaining exchange rate stability is the prime objective of foreign exchange rate intervention, volatility is the main criterion determining the volume and timing of intervention. For this reason, the volume of foreign currency intervention significantly increased following the implementation of free floating in August 1997. At the same time, periods of intervention became more sporadic.

2001 recorded the highest level of the rupiah at Rp 10,256 in annual average terms (see Graph 1), and also the highest volatility. Accordingly, 2001 also saw substantial intervention as Bank Indonesia attempted to maintain exchange rate volatility within a reasonable range.

Graph 1
Annual average rupiah exchange rate



2.4 Method of intervention

Intervention methods can be classified into two types. First, the open method is intervention directly with the market without using an intermediary. The second type of intervention is the closed method, using intermediaries (an agent bank).

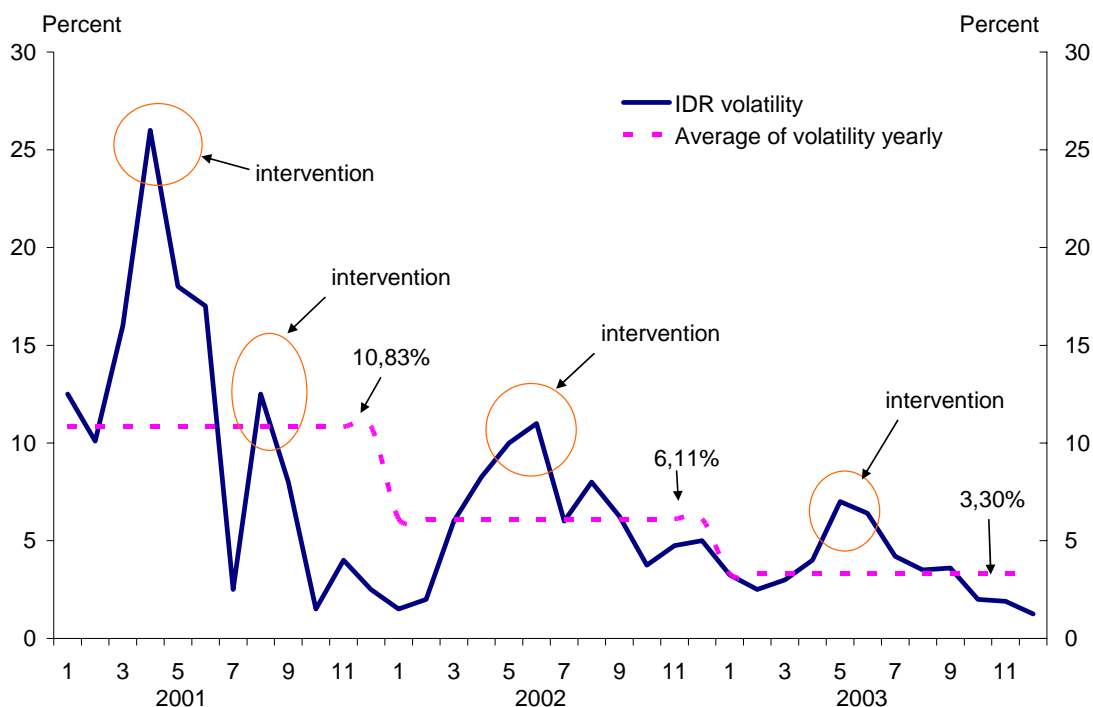
Bank Indonesia chooses between the open and closed method depending on several considerations, as follows:

- Whether Bank Indonesia would prefer market participants to know clearly about the intervention or not.
- Development of market sentiment, which may influence intervention effectiveness.
- Results of technical analysis. Foreign currency intervention can be more effective in influencing market expectations when reinforcing market price trends or momentum that are consistent with market participants' technical analysis.
- Supply and demand for US dollars. Foreign currency intervention is unlikely to be effective when there are limited supplies of US dollars in situations of high demand for dollars.

2.5 Effectiveness of foreign currency intervention

Given Bank Indonesia's objective for foreign currency intervention, efficacy is mainly assessed in relation to rupiah volatility. As seen in Graph 2, rupiah volatility has diminished since free floating was adopted, suggesting the effectiveness of intervention. Reduced rupiah volatility is positive for the economy in general.

Graph 2
Rupiah exchange rate volatility and intervention



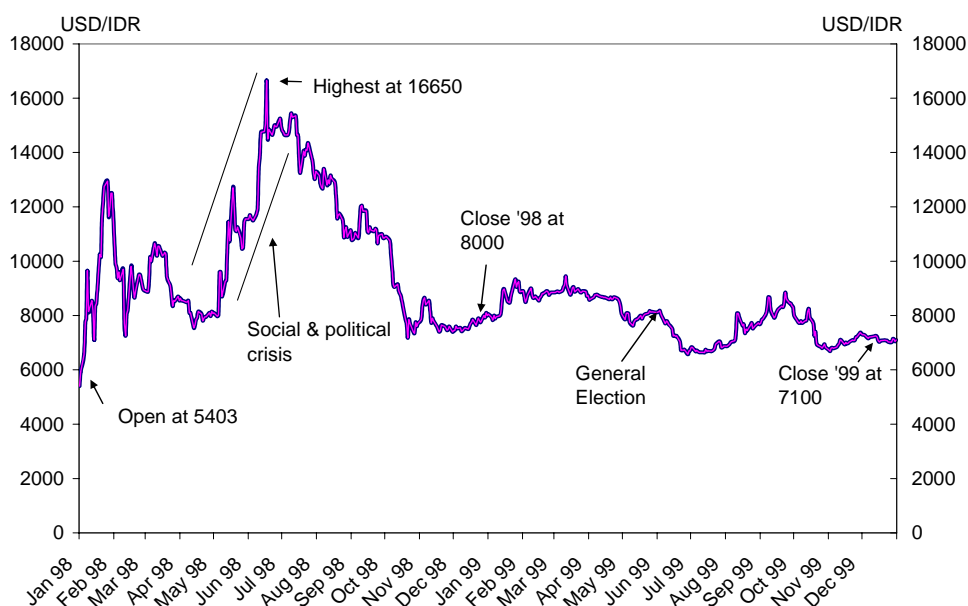
3. Movement of the rupiah exchange rate

This section traces the evolution of the rupiah from 1997 until 2004, illustrating the application of intervention policy:

3.1 1997 to 1999: a weakening rupiah and high volatility (Graph 3)

The rupiah in this period experienced strong fluctuations and severe downward pressure associated with the exchange rate crisis in Thailand. The driving force behind the rupiah turmoil included a fall in confidence of foreign investors as reflected in large capital outflows to pay maturing external debts, and speculative transactions.

Graph 3
Rupiah exchange rate, 1997 – 1999



In addition, worsening domestic economic fundamentals, due to the crisis of public confidence in the banking system and spiralling inflation, were also major contributors to currency turbulence up to July 1997.

Contagion effects from the exchange rate turmoil in Thailand spread to other ASEAN countries after July 1997, and accordingly the rupiah was under downward pressure. The widening of the managed float's intervention band on 11 July 1997, from 8% to 12% (with a lower limit of Rp 2,374 and an upper limit of Rp 2,678 per dollar) failed to abate the downward pressure. Capital outflows accelerated and speculative pressure strengthened. Consequently, the rupiah continued to weaken and, by mid-August 1997, the exchange rate surpassed the upper limit of the intervention band.

In response to the greater pressure on the rupiah and constraints on securing foreign exchange reserves, on 14 August 1997 Bank Indonesia decided to alter the foreign exchange system from managed float to free float. Subsequently rupiah swings became more volatile, particularly as a result of vigorous speculation against the rupiah. The volatility of the exchange rate altered the trading range from about Rp 2,500 to 2,600 per dollar in mid-July 1997 to Rp 2,700 to 3,000 per dollar.

In addition, swap premiums also changed from about 9.0% to 30.1%. From mid-August to the end of September 1997, the exchange rate moved in a narrow range, between Rp 2,900 and Rp 3,000 per dollar. This narrow range resulted from government measures to tighten monetary conditions and active intervention by Bank Indonesia in the foreign currency market through spot, forward, and swap transactions. Intervention aimed at supplying dollars when the market was running out of them, stabilising exchange rate fluctuations, and providing guidance to market players. In addition, measures taken by Bank Indonesia to restrict forward sales of foreign currency from domestic banks to

non-residents were geared towards reducing speculative pressure on the rupiah. The restriction helped reduce rupiah volatility.

After October 1997, the rupiah was again under pressure. The exchange rate became very turbulent and even traded at a low point of about Rp 16,650 per dollar in the middle of June 1998. To address this turmoil, Bank Indonesia added to the supply of dollars by lowering the statutory reserve requirement for foreign currency, and initiated a concerted intervention with the Monetary Authority of Singapore and Bank of Japan. Unfortunately the rupiah was stable only in the short run because of the crisis of confidence in Indonesia's economic prospects and the high demand for dollars either for speculative transactions or for external debt payments. Because of that, attempts by Bank Indonesia to ease tight foreign currency liquidity in order to stabilise the rupiah were ineffective.

During the period from November 1998 to January 1999 the exchange rate was relatively stable in a range of Rp 7,500 to 8,000, mainly due to the improvement of Indonesian economic fundamentals and a number of appropriate fiscal policy measures taken by the government.

However, between February 1999 and March 1999, the rupiah depreciated to a range of Rp 8,500 to 9,260. Depreciation of a few Asian region currencies (THB, SGD) and the postponement of a freeze of several insolvent commercial banks had impacted negatively on the exchange rate.

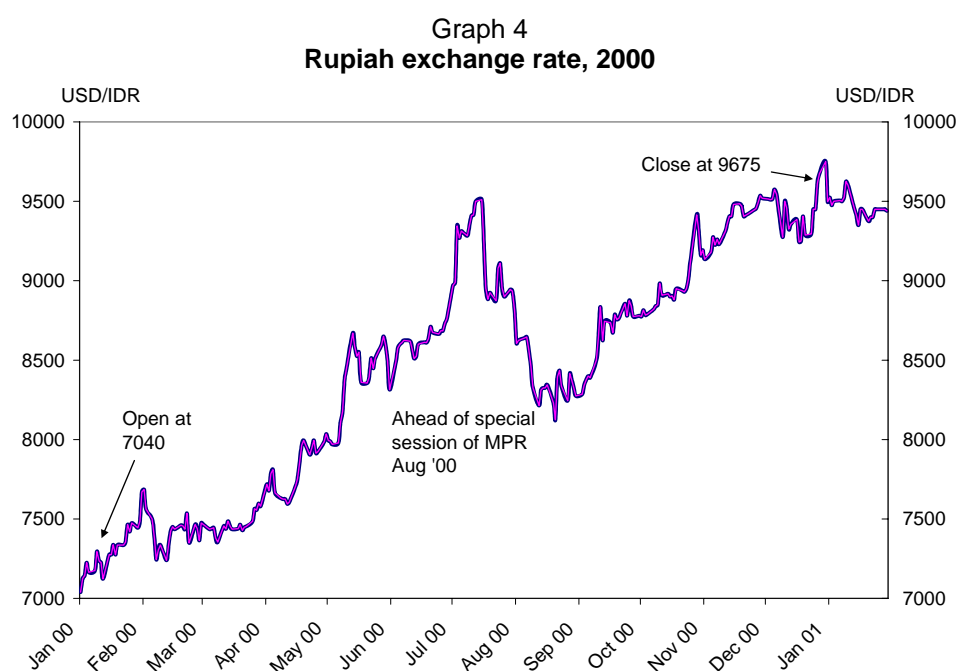
By the end of 1999, the exchange rate had become relatively stable in a range of Rp 8,500 to 8,800. The stability of the exchange rate was partly the result of strong demand for rupiah related to fiscal year tax payments and loan disbursements from official creditors (the IMF, ADB, JEXIM). In addition, preparation for the upcoming general election had also contributed to positive sentiment over the outlook for the exchange rate.

To sum up, in addition to negative sentiment, pressure against the exchange rate during the period 1998-99 was mainly due to fundamental factors including huge private and government offshore debt, and associated deteriorating country risk.

To stabilise the rupiah, the government employed several measures such as restoration of monetary stability, facilitation of trade finance by Bank Indonesia, restructuring of external corporate debt, and sterilisation of the domestic liquidity effect of government expenditures through sale of foreign exchange in the foreign exchange market.

3.2 2000: rupiah weakening and increasing volatility (Graph 4)

In the year 2000, the rupiah experienced renewed depreciation with increased volatility. The annual average rupiah exchange rate increased from Rp 7,850 to Rp 8,400.



Leading into 2000, the rupiah had performed very well and strengthened against the US dollar. At the end of 1999 the newly elected government had generated optimism about social and political stability and economic recovery. These factors had resulted in an exchange rate close to a level of Rp 7,000 per US dollar.

However, the rupiah subsequently lost its support and weakened from early April 2000 due to social unrest, political uncertainties and the threat of disintegration of several regions in Indonesia. Moreover the rating agency Standard & Poor's had also downgraded sovereign long-term and short-term debt (from CCC+ and C to become Selective Default/SD). All these factors had encouraged private individuals and corporations to sell rupiah for US dollars so that the exchange rate weakened to a level of Rp 8,000.

From May 2000 to August 2000, the exchange rate continued to weaken and touched a level of Rp 9,600. The main factor was declining investor confidence in line with difficult social and political conditions ahead of the Annual Session of the People's Consultative Assembly. From then until the end of 2000, the rupiah weakened further due to the strengthening of the US dollar against major currencies during the period, coupled with increasing corporate demand and social unrest related to terrorist bombing acts at a number of religious places at year end. In December 2000, the monthly average exchange rate was Rp 9,435, a fall of 22.9% through the year. The rupiah closed at the low level of Rp 9,675 at year end.

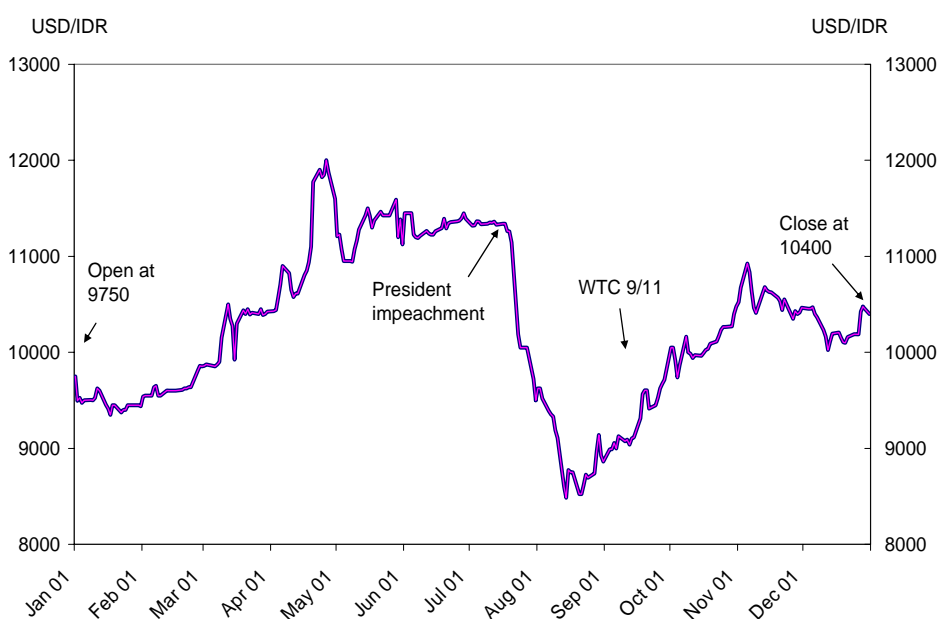
To address the ongoing depreciation of the rupiah, Bank Indonesia started tightening monetary conditions through open market operations to absorb excess rupiah liquidity. The policy (SBI) interest rate was raised to give a signal of monetary tightening to the market, and to reduce the pressure on the exchange rate. Bank Indonesia also intervened in the foreign exchange market by selling US dollars, thereby providing an additional supply of dollars in the market as well as absorbing excess rupiah liquidity.

3.3 2001: sharp rupiah depreciation (Graph 5)

In the year 2001, the exchange rate sharply depreciated. The rupiah closed the year at Rp 10,400, a fall of 7% compared with the end-December 2000 level of Rp 9,675.

In the first four months of 2001, the rupiah had depreciated due to panic buying of US dollars because of increasing social and political uncertainties in relation to the impeachment of the leadership of the nation.

Graph 5
Rupiah exchange rate, 2001



From then until July 2001, the exchange rate was relatively stable, moving sideways within a range of Rp 11,000 to 11,500. Although the rupiah remained undervalued in most eyes, market participants would not take positions, preferring instead to “wait and see”. Market focus was on the upcoming Special Session of the People’s Consultative Assembly.

From August until September 2001, the rupiah strengthened quite sharply due to a smooth and successful People’s Consultative Assembly meeting to nominate a new President. Overall, improving market sentiment was probably related to better social, economic, and security conditions. The rupiah appreciated as far as Rp 8,454 during this period.

The above conditions were not to last long, and the rupiah again slumped. In the final quarter of 2001, the exchange rate weakened and broke the psychological level of Rp 10,000 following profit taking after the strong rupiah phase associated with the successful transition of the national leadership. Reduced investor and corporate confidence about fundamental economic conditions was caused by the World Trade Center events on 11 September 2001, which were expected to slow global economic activity and badly affect the Indonesian economy.

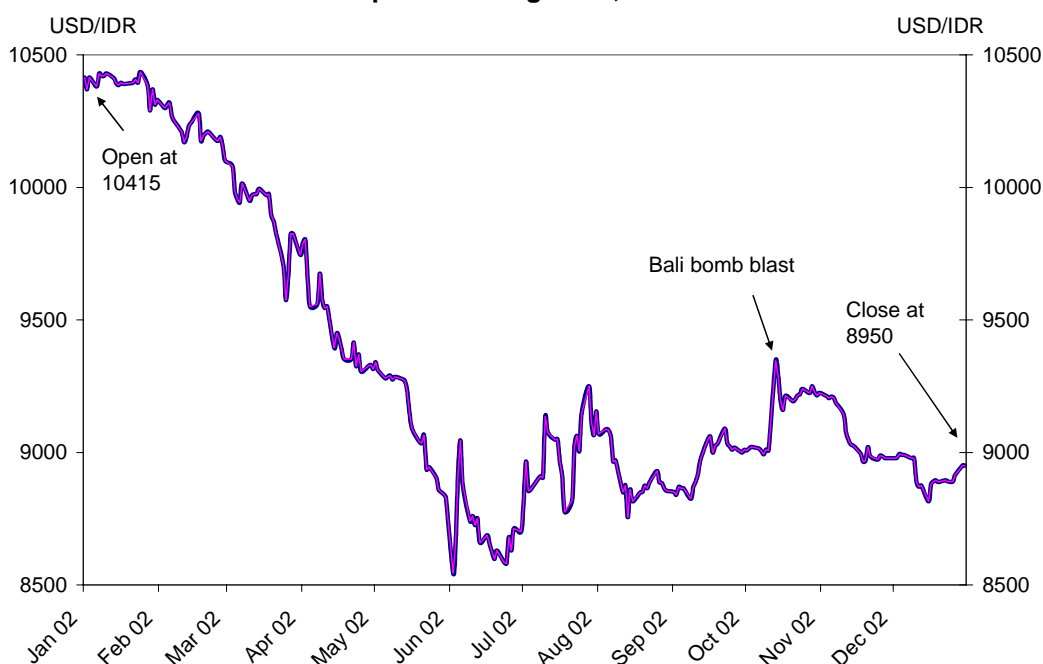
Again, to cope with sharp fluctuations of the exchange rate, Bank Indonesia conducted operations to absorb excess liquidity from the market through open market operations, and at the same time by intervention to sell US dollars in the market. Further, on 12 January 2002, Bank Indonesia issued regulation number 3/3/2001 which was aimed at limiting non-resident rupiah transactions with the potential to be used for speculation.

3.4 2002: rupiah appreciation with lower volatility (Graph 6)

In 2002, the rupiah sharply appreciated, closing at Rp 8,950, up 16.2% compared with the end of December 2001 (Rp 10,400). The rupiah had the most rapid appreciation of any currency in Asia during 2002.

In the first half of 2002, the exchange rate was supported by a surplus on the current account, touching Rp 8,425 at its strongest point. However, exchange rate volatility returned as the result of the Bali bomb blast in October 2002. This event triggered panic buying of US dollars and the rupiah quickly depreciated to as high as Rp 9,425. Rapid progress in restoring internal domestic security improved market confidence, and the rupiah appreciated to a level below Rp 9,000.

Graph 6
Rupiah exchange rate, 2002



To limit foreign exchange speculation, Bank Indonesia continued to monitor the compliance of banks with regulation PBI No 3/3/2001 on the limitation of rupiah transactions and foreign currency credit expansion. In this regulation, forward sale and swap transactions beyond certain amounts with non-residents continued to be prohibited, unless for real economic transactions (ie underlying transactions). The monitoring process strengthened banks' compliance, thereby helping to contain rupiah volatility.

To monitor market developments, Bank Indonesia carefully scrutinised foreign exchange transactions through the Money Market Information Centre (PIPU). This monitoring aimed at ensuring that market transactions were on a normal track according to the common practice prevailing in the foreign exchange market. Monitoring is part of an early warning system aimed at identifying at an early stage transactions that could potentially destabilise the rupiah market. In addition, Bank Indonesia routinely conducts surveys to learn about market agents' perceptions on the direction of exchange rate development. Results from this survey are one consideration in implementing exchange rate policy.

Based on its monitoring of market conditions, Bank Indonesia engaged in moral suasion to ease market pressures, by informing market agents of Bank Indonesia's view of matters. During the period under review, this was done on several occasions, including during the episode of panic buying of dollars by market players who over-reacted to the Bali tragedy. This policy strengthened market confidence and prevented further rupiah depreciation.

Because of the knowledge that Bank Indonesia obtains through its monitoring activities, moral suasion can in some situations improve market perceptions of the implications of events that have triggered baseless rumours. Detection of negative rumours and data flows through PIPU and from surveys, as well as market condition assessments and information from other sources such as the government and international institutions, provides a valuable information base not readily available to the market as a whole. Therefore, moral suasion might be seen as actions to expand the relevant information set available to market agents, thereby coordinating perceptions and perspectives on sensitive issues. In doing so, Bank Indonesia can indirectly change the attitudes of market agents that dominantly affect the exchange rate.

To complement these various policies, Bank Indonesia also undertook foreign exchange intervention by selling dollars in the market. These operations served two purposes. In addition to its role in absorbing excess rupiah liquidity, the policy also aimed at lessening volatility in the exchange rate by easing market pressures associated with the limited supply of dollars. In its implementation, this policy consistently took into account market psychology and the adequacy of foreign exchange reserves. Intervention was successful in reducing rupiah fluctuations throughout the reporting year, as shown in a declining average daily volatility of the exchange rate to 1.4% from 2.8% in the previous period. Looking at the level of the exchange rate, the foreign exchange intervention policy was also quite effective in maintaining the appreciating trend of the rupiah during 2002, and keeping the exchange rate below Rp 9,000 per US dollar until the end of the year.

3.5 2003: rupiah stability (Graph 7)

Over 2003, the rupiah was stable with a strengthening trend against the US dollar. The exchange rate closed the year at Rp 8,420, an appreciation of 6.3% as compared with the level at the end of December 2002 (Rp 8,950). The rupiah had traded within a range of Rp 8,175 to 9,088.

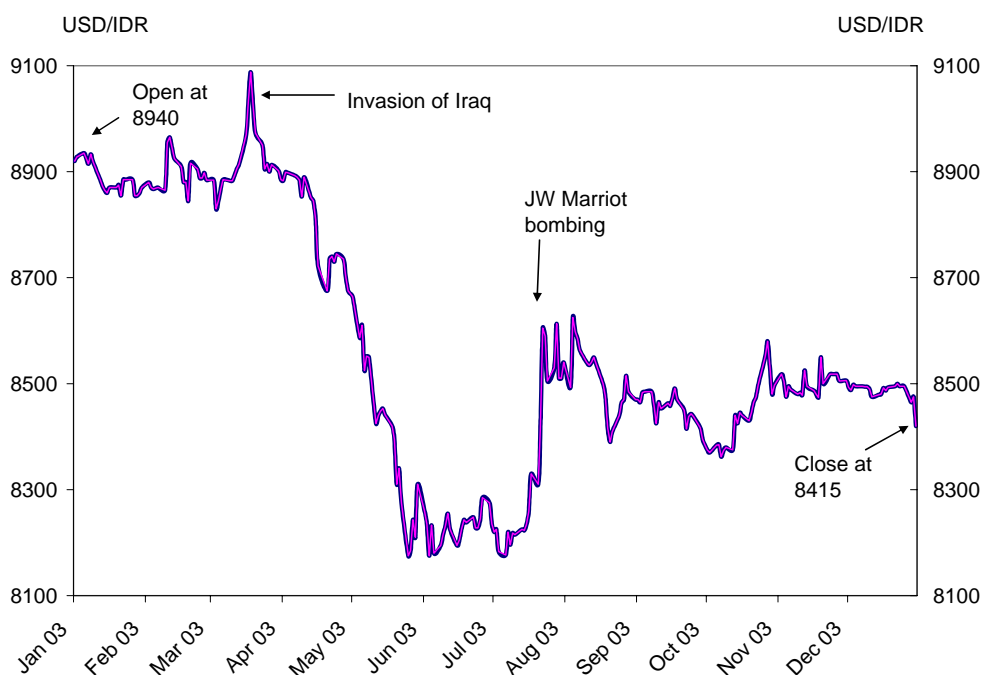
Overall, various factors such as decreased risk, an adequate supply of foreign exchange in the market, higher returns on rupiah instruments, and improved economic fundamentals as well as Bank Indonesia's commitment to maintaining exchange rate stability turned out to play a significant role in generating positive market sentiment and lifting the exchange rate. Nonetheless, the rapid capital inflows needed to be monitored closely because most were invested in short term portfolio assets (hot money) which could easily reverse.

Bank Indonesia continuously monitored foreign currency transaction activities, either indirectly (off-site supervision) or directly (on-site supervision). Indirect supervision was conducted through the Dealing Room, and analysis of inter bank transaction data recorded with the PIPU, foreign exchange flow reports (LLD), as well as data provided by the banks' monthly reports to Bank Indonesia.

During the reporting period, Bank Indonesia conducted a number of on-site supervision visits to the main banks active in the market. Such visits were conducted ahead of the 2003 Annual Session of the People's Consultative Assembly, when the political environment was marked by growing concerns. At

the same time, foreign investors' interest was shifting from rupiah-denominated bond investments (high yielding currency) to offshore stock exchanges (high growth assets), particularly on the back of efforts by a foreign financial institution to reduce its rupiah exposure. These supervisory measures, later combined with foreign currency intervention, proved sufficiently effective in subduing market pressures on the rupiah and led the currency to gradually stabilise near the Rp 8,400 level against the US dollar.

Graph 7
Rupiah exchange rate, 2003



During this period too, foreign currency intervention policy was intended, ultimately, to maintain exchange rate stability, especially at times when negative factors weighed on the rupiah. However, foreign exchange intervention was undertaken only when moral suasion was deemed ineffective in calming market participants and curbing excessive exchange rate movements. The sale of US dollars in the foreign exchange market was executed to provide a resistance level for the currency, to reduce the probability of exchange rate movements beyond that level. Policy implementation is always undertaken with due consideration for supply and demand conditions in the foreign currency market. In this context, technical analysis is used to identify “resistance levels” that if reinforced by intervention could interrupt the momentum that leads to panic buying of dollars.

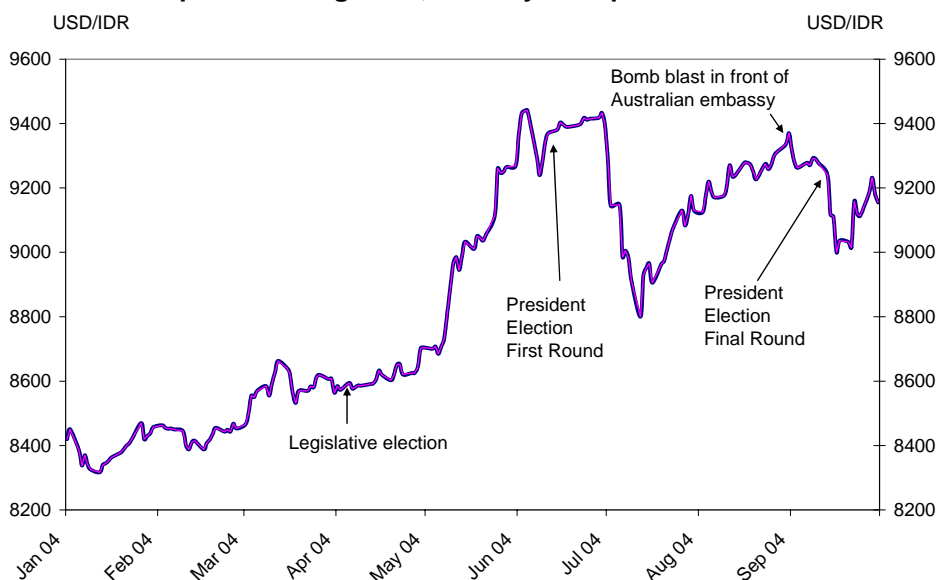
Foreign exchange intervention operations carried out during 2003 indeed proved effective in minimising excessive exchange rate volatility. This is observable from the rupiah’s performance during the year, which was far more stable than in previous years.

To further support the supervision of foreign exchange transactions, Bank Indonesia also issued a number of regulations during the year, specifically Bank Indonesia Regulation (PBI) No 5/24/PBI/2003, dated 31 October 2003, in reference to Money Market Information Centres; and Circular Letter No 3/34/DPD, dated 24 December 2003, on procedures for the submission of data related to foreign exchange transaction through the PIPU. These regulations deal with reporting procedures, including timing, and impose sanctions should the reports provided by the banks not adhere to the regulations. In addition, PBI No 3/3/2001, dated 12 January 2001, on the limitation of rupiah transactions and the provision of foreign currency credit by banks, was streamlined. In general, the current regulations are deemed adequate to limit speculative activities in the foreign exchange markets.

3.6 January–September 2004: depreciation and relatively high volatility (Graphs 8 and 9)

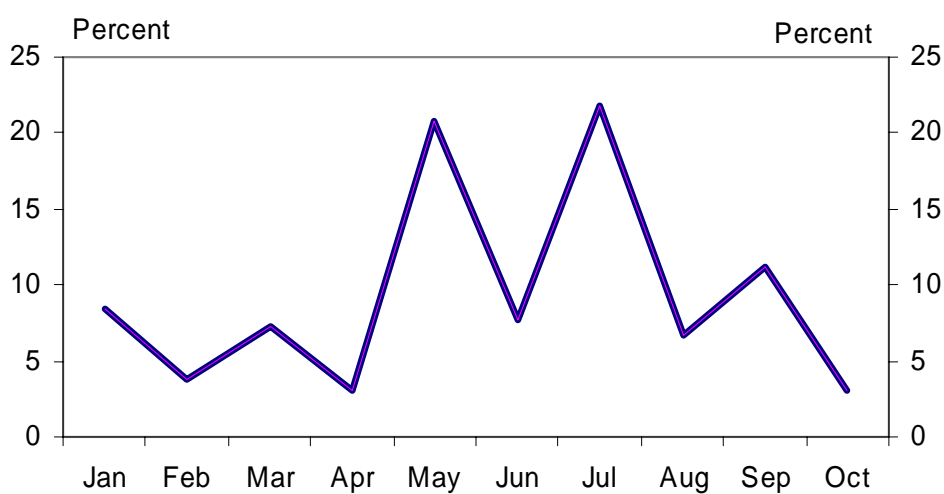
In 2004, the exchange rate weakened. From early January 2004 to September 2004 the rupiah depreciated by 9%, driven by several internal and external factors.

Graph 8
Rupiah exchange rate, January to September 2004



The 2004 general election became the main domestic factor drawing the market's attention. From the beginning of the election campaign (March 2004) until September 2004, the exchange rate fluctuated and tended to weaken. The successful conclusion of the first general election process provided a direct positive short term boost for the rupiah. However, the Kuningan bomb blast in September 2004 undermined that positive sentiment.

Graph 9
Volatility of the Rupiah, Jan-Oct 2004



The main external factor was the recovery of the US economy, which led the Fed to increase the policy rate from 1.25% to 1.75%, producing a negative impact on the rupiah exchange rate against the US dollar.

In the fourth quarter of 2004, especially after implementation of the Newly Improved Net Open Position regulation in September 2004, the rupiah became more stable (as reflected in reduced measured volatility). Meanwhile, the market continued to focus on the first 100 days of the new cabinet under the leadership of the newly elected President.

4. Policies linked to exchange rate

Foreign currency intervention is not the only tool used by Bank Indonesia to maintain rupiah stability. Foreign currency intervention may not always be effective alone, depending on the current global financial market and the complexity of macro and micro economic conditions.

To further support foreign exchange management, Bank Indonesia has issued a number of regulations, and conducts direct and indirect supervision as follows:

1. **Bank Indonesia Regulation (PBI) No 3/3/2001 On The Restriction of Rupiah Transactions and Foreign Currency Credit Offered by Banks (12 January 2001).** This regulation was introduced to restrict rupiah transactions offshore in order to mitigate the volatility of the rupiah. The new regulation is enforced so as to prohibit onshore banks from lending to non-resident accounts or transferring rupiah to offshore accounts. The regulation effectively prohibits offshore trading in rupiah. The rupiah, then, is a non-deliverable currency in the offshore market.
2. **Conduct indirect supervision by monitoring foreign exchange transactions.** Commercial banks dealing in foreign exchange must submit daily transactions reports through a PIPU terminal (on-line). The obligation to submit reports strongly supports the monitoring of up-to-date domestic foreign exchange activities.
3. **Conduct a number of on-site supervision visits among the main commercial banks which actively trade in the foreign exchange market.** For example, some bank visits were conducted in 2003 in the context of political uncertainty and shifting foreign investor sentiment (see above for more detail).
4. **Bank Indonesia Regulation (PBI) No 6/20/PBI/2004 Improved Net Open Position (15 July 2004).** The regulation was introduced to decrease speculative activities in the foreign exchange market, as reflected by the downward trend in the level of banks' net open positions (NOP).

5. Conclusion

- Since the implementation of free floating in August 1997, Indonesia has experienced movements of the exchange rate which are not only driven by fundamental factors reflecting economic conditions, but which are also substantially influenced by market reactions to non-economic events that have increased risk premia.
- Bank Indonesia, which is authorised to maintain exchange rate stability, has conducted several policies such as intensive monitoring of foreign exchange market transactions, moral suasion, and intervention in the domestic foreign exchange market.
- Foreign exchange market intervention can be used to address unwarranted exchange rate movements stemming from temporary shocks. It is not an independent policy instrument and cannot generate permanent changes in exchange rates, especially when the objectives are inconsistent with macro economic policies.
- To further reduce unwelcome fluctuations, Bank Indonesia has issued several regulations such as limitations on transactions by non-residents and on net open positions, and has conducted both indirect (off-site) and direct (on-site) supervision of market participants.

Approaching a decade of no foreign exchange intervention - lessons from Israel¹

Meir Sokoler²

I. Introduction

Since June 1997, the Bank of Israel (BOI), has not intervened in the Israeli foreign exchange market.³ The non-intervention policy followed a long period of heavy BOI intervention; first as matter of choice and later because it had to defend the lower (appreciating) edge of the official crawling exchange rate band.

The purpose of this paper is to explain the reasons for the non-intervention policy and in particular to discuss how this policy

- a) improved the effectiveness of monetary policy;
- b) contributed to the enhancement of financial stability;
- c) increased the disciplining force of financial markets on policy makers.

The paper is organised as follows: section II provides a brief description of the relevant history and the institutional setup. Section III discusses how the non-intervention policy enhanced the credibility of the inflation targeting framework, thereby increasing the effectiveness of monetary policy. Section IV describes how, as a result of non-intervention, the foreign exchange market has developed and learned to cope with foreign exchange uncertainty, thus increasing the resilience of Israel's financial system. Section V discusses how the non-intervention policy (and the policy of promoting the development of financial markers) led to greater discipline being imposed by financial markets on policy makers. Section VI describes conditions under which foreign exchange intervention might be useful. Section VII offers a conclusion.

II. History and the institutional setup

Throughout its existence Israel had a long history of foreign exchange intervention, which at different times was carried out for different purposes. From the mid-1980s to about the mid-1990s stabilising the exchange rate by foreign exchange intervention was used first to reduce inflation from a three-digit level and then to keep it within or close to a range of 15-20% a year.

Initially the exchange rate was pegged to the US dollar and then to a basket of currencies. Later a horizontal band was introduced, replaced subsequently by an upward sloping band (which widened through time) to reflect the difference between inflation in Israel and inflation abroad. Then, as a result of the realisation that Israel had no choice but to join the worldwide trend of reducing inflation to its current low level, an inflation targeting framework was introduced in 1992, but its full implications becoming apparent only in 1994.

In that year, the BOI began use the short-term interest rate as its main tool to achieve the inflation target. Foreign exchange intervention nevertheless continued with the aim of keeping the exchange rate at the publicly declared mid-point of the crawling band. The attempt to use the interest rate to

¹ I am indebted to the participants of 2004 BIS Deputy Governors meetings and in particular to David Archer for useful and thoughtful comments.

² Deputy Governor, Bank of Israel.

³ There were a few days in January 1998 when the BOI purchased US\$ 492 million to prevent the new shekel from crossing the lower (appreciating) edge of the exchange rate band (ie, to prevent further appreciation of the new shekel).

achieve the inflation target and at the same time use foreign exchange intervention to prevent the exchange rate moving too far away from the mid-point of the band led to a long period of large capital imports which the BOI sterilised at increasing costs and to growing public criticism.

This development led the BOI to declare on 2 February 1996 that it would no longer intervene as long as the exchange rate was within the official band. The change of policy in did not stop the continued appreciation of the domestic currency, the new shekel, and eventually the exchange rate reached the lower (appreciating) edge of the band and remained there for more than six months. The massive foreign exchange purchases during the period February 1996 to June 1997 (more than US\$8 billion) were again sterilised by the BOI. The main sterilisation instrument was interest-bearing deposits of commercial banks at the BOI. When these deposits, which grew very fast, became a major source of the commercial banks' profits it was realised that the sterilisation policy was not sustainable. Consequently, on 17 June 1997 the purchases stopped and the BOI has not intervened in the foreign exchange market since (Table 1). On that day, an asymmetric change in the slopes of the band was introduced; 6% for the upper limit and 4% for the lower limit. Two additional decreases in the slope of the lower limit took place; in August 1998 it was reduced to two percent and in December 2001 it was reduced to zero. The width of the band today is 82% and it is growing each year. The position of the BOI is that it should have been eliminated a long time ago, but so far the government has chosen not to do so. The band has not been a problem for monetary policy for some years now, but until it is removed it has the potential to become one again. It should be pointed out that the BOI cannot unilaterally discard the band altogether. The exchange rate band is part of the exchange rate regime, which by law can be changed only with the approval of the government (see more on this issue on page 11).

Table 1

Changes in exchange rate band's width and foreign exchange intervention

	Width of ER band (percent)	Foreign exchange purchases	Distance of ER from lower limit (percent)
1994–1997 H1	13	\$16 billion	3
1997 H2–1999	37	\$0.4 billion	8
2000-2004	60	0	14

III. The effect of non-intervention policy on monetary policy

The non-intervention policy enhanced the effectiveness of monetary policy in several ways. First, it freed an important channel of the monetary transmission mechanism, namely the exchange rate. Thus, as Elkayam (2003) shows, the response of inflation to a 1% shock in the key rate is three times larger in the non-intervention policy period than previously. Second, the end of sterilisation operations in June 1997 contributed over time to a realisation that the danger of fiscal dominance was averted and that the Israeli regime looked more like a monetary-dominant one (Liviatan, 2003). During the heavy sterilisation period, monetary policy was in effect close to the dire consequence of facing a situation described by Sargent and Wallace (1981) as "unpleasant monetary arithmetic". Third, the credibility of the inflation targeting regime increased in the non-intervention policy period as compared to previous periods. Brenner and Sokoler (2001) show that in the non-intervention policy period the response of inflation expectations to changes in the key rate was in the expected direction and quite large, about 0.7% for every percentage point change of the key rate. Prior to that period changes in the key rate did not affect inflation expectations.

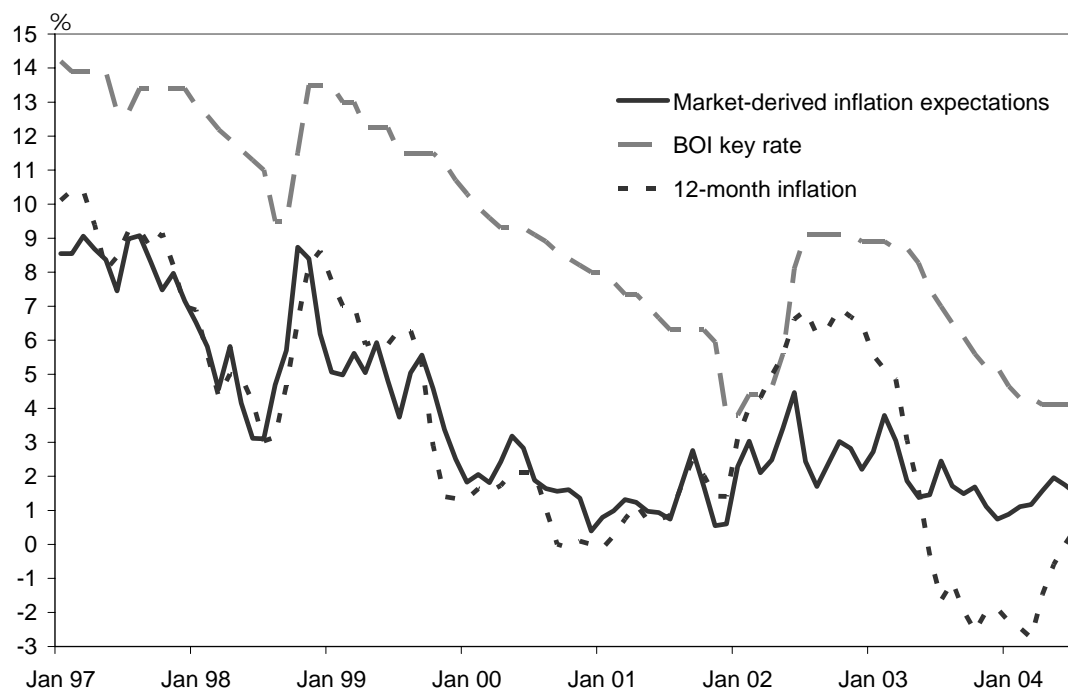
In short, the increased effectiveness of monetary policy, due in large part to the non-intervention policy, shortened the period in which heavy monetary restraint was necessary, first to reduce inflation and later to maintain price stability. This development in turn reduced the political pressure on the BOI

(see Cukierman, 2003), which placed the BOI in a better position to deal effectively with the numerous and various shocks which Israel's economy faces continuously.

It is no accident that the last stage of ending inflation, stabilising inflation expectations around 2% per year, and reducing the BOI key rate to western countries' levels, began shortly after foreign exchange intervention stopped.

Figure 1

Inflation, inflation expectation and the key rate 1997-2004



Coping with foreign exchange risk

Greater exchange rate flexibility and reduced direct foreign exchange intervention are normally associated with larger exchange rate variability. Some authors, eg, Eichengreen, Hausmann and Panizza (2003) argue that higher exchange rate volatility leads to higher costs of hedging foreign exchange risk, thus discouraging hedging and hence exacerbating the currency mismatch problem. Israel's experience runs contrary to this argument and supports the opposite view as in Goldstein and Turner (2004), Martinez and Werner (2001) and Bleakly and Cowan (2002). The evidence from Israel indicates that the incentive to hedge grows when there is no foreign exchange central bank intervention and the exchange rate is allowed to fluctuate.

The awareness of the Israeli business sector that coping with foreign exchange risk was its responsibility grew especially after the Russian - LTCM crisis of October-November 1998. During these two months the exchange rate depreciated by 11%, exposing the consequences of a large currency mismatch in the business sector. At that time there was heavy pressure on the BOI to sell foreign exchange reserves in order to stabilise the exchange rate and improve the balance sheet of the business sector. The central bank withstood the pressures and did not intervene. Since then, the business sector has understood that it takes a foreign exchange currency position at its own peril. In addition, the Supervisor of Banks required, as a prudential measure, the boards of directors of commercial banks to assess the foreign exchange exposure of their customers in order to avoid foreign exchange risk from turning into bank credit risk. As a result the currency mismatch was largely reversed as shown in Table 2.

Table 2

Foreign exchange currency position of the business sectorPrivate sector FX position – excess of FX liabilities over assets
(End of period, US\$ billion)

	Business sector	Household sector	Banking sector
1997	16.7	-10.7	-1.6
1998	12.8	-13.2	-2
1999	10.9	-14.1	-0.6
2000	3.6	-14.0	-1.3
2001	6.7	-16.7	-0.4
2002	8.8	-19.6	-1.4
2003	6.7	-22.0	-1.5
2004-2	0.6	-22.7	-0.8

An interesting feature of the non-intervention policy period is the stability of the new shekel exchange rate. Since June 1997, the new shekel has been a very stable currency by international comparison. Of particular interest is the fact that the stability of the new shekel stands out even if one compares it to countries such as Australia, Canada, Sweden and the UK. These countries are inflation targeters that intervene from time to time to smooth out fluctuations in the exchange rate. Israel has had the lowest exchange-rate volatility, whether measured by historical volatility or by implied volatility derived from foreign exchange options premiums (Table 3).

Table 3

**Average of annual historical and implied volatilities
Various countries during 1997-2004**

	Australia	Canada	Israel	Sweden	UK
Average historical volatility ¹	10.8	6.0	6.1	10.6	7.8
Average implied volatility ²	11.1	8.6	6.5	11.2	8.8

¹ Average standard deviation of log price change over 10-day period. ² Average 1-month implied volatility, Feb 2003 - Aug 2004.

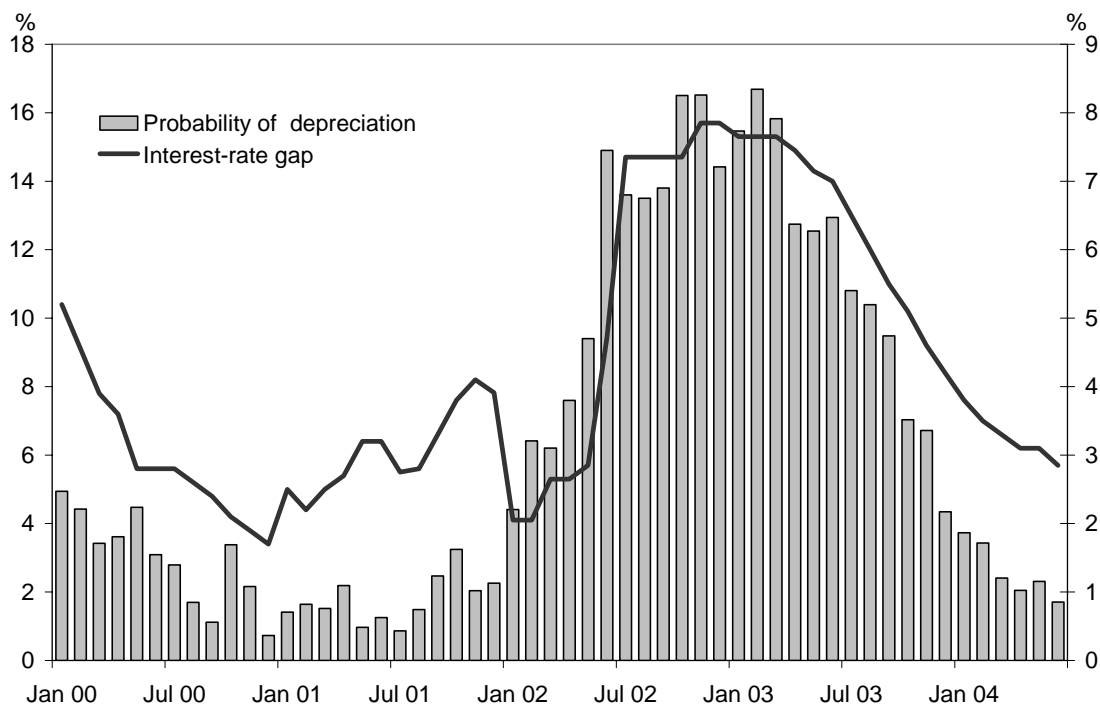
The impressive stability of Israel's exchange rate cannot be attributed to shallowness of the Israeli foreign exchange market, which, while certainly less deep than that of the UK and the other three countries in Table 3, is not a thin market. Since June 1997, daily average turnover grew from a level US\$ 0.5 billion to US\$ 1.6 billion; other indicators, such the bid-offer spread, also show that the foreign exchange market is maturing. We believe that the stability of the exchange rate is a result of decisions taken by many players (domestic and foreign) with different needs and heterogeneous expectations, who know from experience that they cannot rely on BOI intervention in the foreign exchange market. Under these conditions speculation tends to be a stabilising factor, thus enhancing financial stability. An indication of the stability of the foreign exchange market, which contributes to overall financial stability, is the probability of a large depreciation derived from BOI foreign exchange call options (Figure 2). Recently this probability has remained very low even when the gap between the BOI key rate and the federal funds rate narrowed considerably.

The most recent sharp increase in this probability occurred in the first quarter of 2002, following an unexpected 2% cut of the BOI interest rate as part of a package agreed with the government, which was not honored by all parties. According to the deal, the BOI announced a (very surprising) reduction of two percentage points in its key rate (from 5.8% to 3.8%) and the government pledged publicly to curb its growing deficit. When the deficit kept growing, and against a background of a deteriorating

security situation in April 2002, the probability of a 10% depreciation began to grow rapidly. It started to decline at the beginning of 2003 only after the key rate was raised sharply in several steps, reaching 9.1%, and the government cut transfer payments heavily, which indicated its determination to return to a policy of fiscal prudence. It is interesting, except for the episode just described, to note that throughout most of the period since 1997, the probability of 10% depreciation remained low in spite of many unfavourable shocks which the economy had to endure.

Figure 2

Probability of depreciation and the gap between the BOI key rate and the federal funds rate



IV. non-intervention policy as a policy force

Flexible exchange rates tend to reveal unsound policies more quickly than fixed rates and thus exert discipline on policy makers. This point, which is made by Tornell and Velasco (2000) and others, is particularly relevant for Israel. For historical reasons, going back to the period of three-digit inflation in the 1980s, the price of housing in Israel is still linked to the US dollar (Figure 3). The housing component is more than 20% of the CPI. Thus, people who buy (sell) or rent houses, as well as exporters and importers are quite vulnerable to sharp fluctuations in the dollar exchange rate, and can therefore be viewed as lobby against large fluctuations of the exchange rate.

In particular they dislike those exchange rate fluctuations against which it is difficult or very expensive to insure. Those fluctuations are often the result of unsound macroeconomic policies and as a result have often caused reversals of these policies.

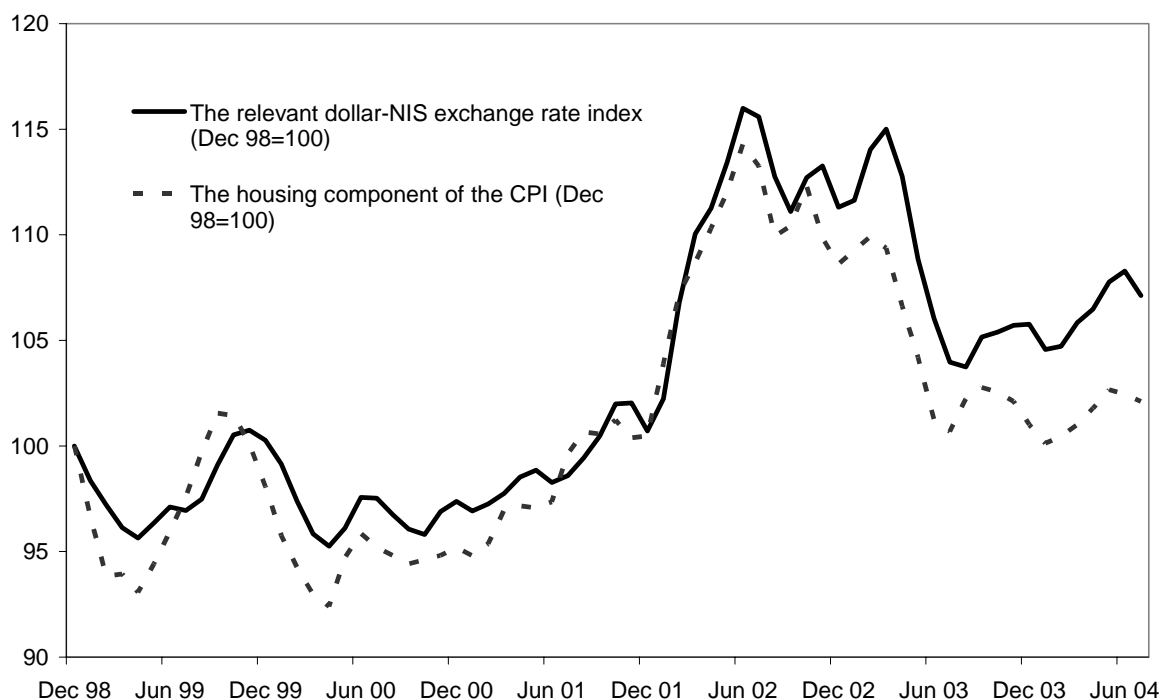
The events of the first half of 2002 serve as an illustration of how rapidly both fiscal and monetary steps can be reversed in response to pressures from the foreign exchange market and the bond market.

At the end of 2001, following a sharp deterioration in economic activity and the government's fiscal position, and in the face of a very bad security situation, the BOI and the government agreed on a package which included a reduction in the key rate from 5.8% to 3.8%; a public promise by the government to make the fiscal adjustments necessary to bring the deficit to the level planned earlier

(3% of GDP) notwithstanding the deep recession in economic activity; removing the last restrictions on capital outflows; reducing to zero the slope of the lower limit of the foreign exchange band; and removing the ceiling on what is in effect a central bank tradable note (makam), thus giving the BOI more operational independence.

Figure 3

The NIS-dollar exchange rate index and the housing component of the CPI



All the elements of the package were carried out, except the government's promise to keep the deficit at the targeted level.

The reduction in the key rate took place in December 2001. When it became clear that the government's deficit for 2002 was going to exceed the agreed limit by a large margin, financial markets reacted with a vengeance: the exchange rate depreciated by 17% within six months, foreign exchange volatility rose from 6.4% to 16% (the implied six months volatility derived from foreign exchange options), the yield on the one-year government bond (regular and CPI linked, the latter serving as benchmark for mortgage rates) rose from 6.5% to 11.7% and from 3.8% to 5.8%, respectively, within five months.

These market reactions had strong effects on both monetary and fiscal policies. The BOI increased its key rate from 3.8% to 9.1% within four months. The government announced a credible plan of general expenditure cuts and welfare expenditure reforms. Later, US government guarantees were received, but these were conditional on continued government fiscal prudence. I doubt very much whether the corrective measures would have been taken if the BOI had intervened in the foreign exchange market and not let the exchange rate respond, or if a long-term bond market and its role as a benchmark for mortgages did not exist.

V. Conditions for foreign exchange intervention

Despite the fact that the BOI has not intervened in the foreign exchange market for a period approaching a decade, such intervention could not and should not be ruled out in the future. There are three main possible reasons for future foreign exchange intervention; monetary policy, malfunctioning of the foreign exchange market, foreign exchange reserve accumulation (decumulation).

Foreign exchange reserves are typically one of several assets on the central bank's balance sheet, and can in principle be used by the central bank to inject (withdraw) liquidity. In the context of an inflation targeting framework, where the main policy instrument is the short-term interest rate, buying (selling) foreign exchange reserves may be used by the central bank as a signaling device. In particular, foreign exchange intervention may signal to the market that the central bank considers movements in the exchange rate to be excessive in relation to what the central bank thinks are the fundamentals. In order for such intervention to be effective, the central bank must have established a high degree of credibility in carrying out its main task, which is maintaining price stability. Since non-sterilised foreign exchange intervention is appropriately viewed as a legitimate monetary operation, any attempt by the government to restrict movements of the exchange rate means that the Central Bank is not in full control of its balance sheet. This in turn means that it is not entirely free with respect to the use of monetary instruments. The BOI has been pressing to change the current BOI law from 1954 which, among other important changes, would discard the band.

Another reason for intervention is to deal with microstructure-type failures resulting in a collapse of liquidity of the foreign exchange market. In a sense, the central bank's foreign exchange operation in this situation plays the role of the provider of liquidity of the last resort to the market. Before intervening for this purpose it is important to determine the reason for such failures. For instance, there might be sudden jumps in the market-making activity of banks in the foreign exchange market.

Another reason for foreign exchange intervention might be the need to add to (deplete) foreign exchange reserves. If this is the reason for intervention, the factors that determine the optimal level of reserves should be made clear to the public. This has been recently done in Israel where the three main reasons for holding reserves were made public and include: a) the need to service the government's foreign debt; b) the option to intervene in the foreign exchange market for monetary policy purposes; c) the need to provide liquidity to banks in extreme situations.

In considering foreign exchange intervention it is important to keep in mind that attempts to work against the market are generally doomed to fail and that intervention should be transparent and not secretive as it used to be in the past. It is important that the strategy of intervention be clear at all times. This does mean that the detail of every intervention be made public in real time.

VI. Conclusion

This paper has given the reasons why for a period approaching a decade the Bank of Israel did not intervene in the foreign exchange market. It has pointed out that the non-intervention policy enhanced, within an inflation targeting regime, the credibility and effectiveness of monetary policy. This policy also contributed a great deal to the internalisation of foreign exchange risk by the private sector, thus enhancing financial stability. Last but not least, letting the exchange rate be determined by market forces exerted market discipline on policy makers, thus increasing the chances that unsound policies will be reversed quickly.

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Foreign exchange intervention and foreign exchange market development in Korea

Gwang-Ju Rhee and Eun Mo Lee

1. Foreign exchange market intervention in Korea

1.1 Foreign exchange system

Over two or three decades, the Korean exchange rate system has been shifted from a fixed to a flexible one. From March 1990, Korea adopted a market average exchange rate system, a form of managed floating exchange rate system. Under this system, the daily exchange rate movements were limited within certain bands.¹ After the currency crisis, Korea changed to a floating exchange rate system in December 1997. In principle, the exchange rate in this system is supposed to be determined by the interaction of foreign exchange supply and demand in the foreign exchange market. Along with this change in the exchange rate system, inflation targeting was chosen as Korea's monetary policy framework.

The objectives of exchange rate operations have changed as the exchange rate system has. Under the managed floating system, the objectives mostly lay in achieving current account equilibrium or maintaining real effective exchange rate stabilisation. Since the adoption of the floating exchange rate system, however, major emphasis is now laid on attaining foreign exchange market stabilisation through alleviating excessive short-term exchange rate volatility. This is partly because under an inflation targeting system achieving the inflation rate target and exchange rate target simultaneously is very difficult. Furthermore, the exchange rate now serves as an information, rather than a policy variable.

There are two administrative bodies involved in Korean exchange rate operations: the Ministry of Finance and Economy (MOFE) and the Bank of Korea (BOK). According to the Foreign Exchange Transaction Act (FETA) and the Bank of Korea Act, the MOFE and the BOK are to serve in partnership as the exchange rate administrative body. The FETA states that the Minister of the MOFE has overall responsibility for foreign exchange policy, including exchange rate operations. The Bank of Korea Act stipulates that the BOK also formulates foreign exchange policy, in cooperation with the MOFE. That is, the BOK is authorised to supervise the money changers and foreign exchange brokers, as well as to oversee foreign exchange transactions, and it endeavours to develop the foreign exchange market as a member of the Seoul foreign exchange market committee.²

The MOFE established the foreign exchange stabilisation fund in March 1967 and has managed it for the purpose of achieving foreign exchange market stability. As legal administrator of the foreign exchange stabilisation fund, the Minister of the MOFE makes overall decisions concerning the means of funding and the operation of the fund.³ However, the actual operation details and ordinary management of the fund are delegated to the Governor of the BOK. The Bank of Korea, as the central bank, holds and manages the nation's international reserves, composed of the foreign exchange stabilisation fund and the BOK's own reserves, and is also in charge of implementing foreign exchange market intervention operations in consultation with the MOFE.

¹ The daily bands were initially set at $\pm 0.4\%$ from the average rate of the previous day. They were widened gradually as follows: $\pm 0.6\%$ (Sep 1991) $\rightarrow \pm 0.8\%$ (Jul 1992) $\rightarrow \pm 1.0\%$ (Oct 1993) $\rightarrow \pm 1.5\%$ (Nov 1994) $\rightarrow \pm 2.25\%$ (Dec 1995) $\rightarrow \pm 10.0\%$ (20 Nov 1997).

² The Seoul foreign exchange market committee was initially established in 1989 as a self-regulating body for consultation among market participants. It established the Seoul code of conduct in December 2001 to promote efficient market practices, to ensure fair competition and relationships between market participants, and to minimise disputes between counterparties.

³ Issuance of foreign exchange stabilisation bonds is used as a main instrument for funding.

1.2 Foreign exchange market intervention

Foreign exchange market intervention has been used as a main instrument in achieving foreign exchange market stabilisation in Korea. As is also the case in other countries with floating exchange rate systems, the objective of foreign exchange intervention in Korea is to (i) mitigate short-term exchange rate volatility, (ii) stabilise the foreign exchange market, (iii) pre-empt speculative attacks, and iv) acquire foreign reserves, rather than to maintain a certain exchange rate target. In fact, it is true that with its thin foreign exchange market Korea faces the possibility of severe exchange rate volatility caused by various external shocks, due to changes in the global economic environment and even geopolitical risks surrounding the Korean Peninsula. In addition, the Korean foreign exchange authorities have also played the role of market maker through intervention by supplying sufficient liquidity in the market and filling the gaps between bids and offers in the market. After the currency crisis in 1997, intervention was, unusually, utilised to increase international reserves in order to enhance Korea's credit rating and avoid the possibility of additional crisis.

As for the intervention tools, verbal intervention by the authorities (MOFE and BOK) and real intervention in the spot market are typically used. Verbal intervention is used to facilitate foreign exchange market stability beforehand or to give speculative forces a warning by conveying the authorities' concerns and intention related to exchange rate movements. However, intervention in the forward market has been employed as rarely as possible, except during the currency crisis period and in the second half of last year, when there was severe speculative trading in the off-shore non-deliverable forwards (NDF) market. In fact, intervention in the NDF market should be done cautiously: intervention operations could become all too frequent since the settlement for intervention is not needed immediately, and the effect of intervention on the exchange rate at maturity would then be the opposite of what was initially intended.

The decision of when and how much to intervene in the market depends on the authorities' discretionary judgment, rather than on any implicit rule. Many elements, such as the strength and nature of the external shock, the movements of market indices, market sentiments and the volume of funds available, are all taken into account in making the discretionary decision. To that end, the BOK monitors exchange rate developments and the foreign exchange market situation on a real-time basis, through incessant contacts with dealers and analysis of various reports from the banks.⁴

In determining the best timing for intervention, the authorities consider the degree of exchange rate misalignment and the permanency of the market distortion. Exchange rate misalignment should not, however, be a strict yardstick for deciding when to intervene at least in the short time horizon, since each method of calculating the equilibrium exchange rate has its own advantages and disadvantages. Furthermore, under the free floating exchange rate system the exchange rate produced by foreign exchange market forces could be regarded as an equilibrium exchange rate in a market behavioural sense. Meanwhile, the magnitude of intervention depends on market participants' order flows, the risk premium and market expectations. The BOK recognises that the effects of identical intervention amounts may differ depending on market participants' expectations.

To gauge the scope of foreign exchange market instability, the following market indices are employed: (i) the pace of exchange rate change, (ii) the magnitude of exchange rate volatility, (iii) the bid-offer spread, (iv) the transaction volume. However, even if foreign exchange market instability does appear, other factors are also broadly considered before intervention is executed, including the source of economic disturbances, the duration of the shock, compatibility of intervention with the current macroeconomic policy, and the availability of intervention resources.

The Bank of Korea intervenes in the market through agents selected among major banks. In doing this, the BOK imposes a confidentiality requirement on these agent banks, to maintain secrecy concerning intervention. As for the criteria used to select the agent banks, priority is given to institutions with the following characteristics: no danger of default risk, ability to provide the BOK with instant market information, and active roles as market makers. Even though these agents trade in the market to meet the intervention goals, the decision-making procedure is, of course, carried out by the BOK, in consultation with the MOFE.

⁴ Since April 1999, the Bank of Korea has managed and operated a foreign exchange information system to closely monitor foreign exchange transactions.

Like other countries, Korea sterilises changes in its domestic money supply brought about by foreign exchange market intervention. The major sterilisation instrument for the BOK is issuance or withdrawal of monetary stabilisation bonds (MSBs).⁵ In some instances, the government has shared the burden of managing the money aggregates by using the foreign exchange stabilisation fund after intervention by the BOK. In the case of the MOFE's intervention in the market using the foreign exchange stabilisation fund, sterilisation by BOK issuance of MSBs is not necessarily required since the money supply does not change.⁶

Despite the absence of any effect of money supply changes on the exchange rate, sterilised intervention is known to be effective in the short run through the signalling channel, the portfolio balance channel and the noise trading channel. Among these, the signalling channel is believed to be most effective in Korea, since the credibility of the central bank, a key element in intervention effectiveness, is considered to be good. In addition, the liquidity effect in the foreign exchange market seems to be significant because of the large scale of intervention relative to market turnover in Korea's thin foreign exchange market.

In principle, the Korean authorities have maintained secrecy regarding foreign exchange intervention. While it necessitates a loss of transparency in exchange rate operations, the secrecy principle aims to achieve the positive effects of avoiding superfluous controversy over the validity of intervention, inducing autonomous exchange rate adjustments through market participants' trading, and preventing speculative forces from benefiting from the relevant information. Another consideration is the fact that most countries, with the exception of some developed countries, do not disclose the details of their interventions.

2. Recent exchange rate and foreign exchange market development

2.1 Exchange rate operation since adoption of free floating system

Since Korea's adoption of the free floating exchange rate system in December 1997, evaluation of its exchange rate operations has shown that on the whole application of market mechanisms to exchange rate determination has been enhanced in comparison to previous periods. On the other hand, some economists have expressed negative views on the policy perspective behind exchange rate operations, arguing that the authorities still have a fear of floating for sharp exchange rate fluctuations. As rationale for this argument, they point to (i) the increase in international reserves due to foreign exchange intervention, (ii) the limited extent of exchange rate volatility, (iii) suspicions that the Korean authorities target a certain level of exchange rate for assuring export price competitiveness.

Notwithstanding these arguments, it is clear that the authorities in Korea have maintained the principle that the exchange rate should be determined in the market by interaction of the demand for and supply of foreign exchange. Foreign exchange market intervention is implemented not to target a certain level but to smooth radical changes in the exchange rate when there is a transient external shock or a bid-offer gap due to one-sided exchange rate expectations.

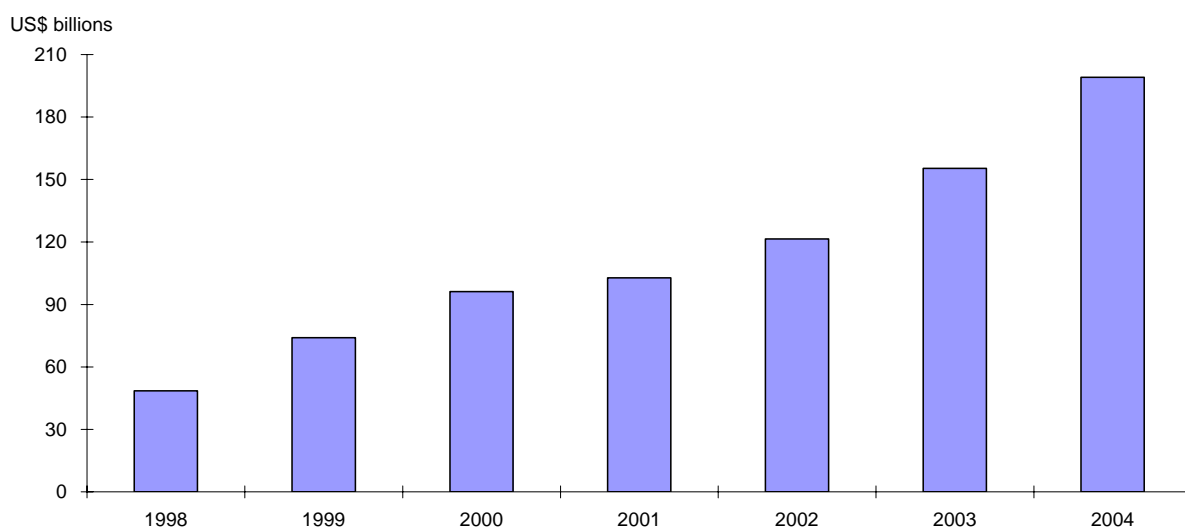
As for the first rationale behind the pessimistic views, it is true that the international reserves of Korea have been increased rapidly, from US\$ 48.5 billion at the end of 1998 to US\$ 199.1 billion at the end of 2004. Nonetheless, in addition to the foreign exchange market intervention, this increase is also largely attributable to the issuance of Foreign Exchange Stabilisation Bonds (US dollar-denominated) by the Korean government, the withdrawal of foreign exchange deposits from commercial banks, and the interest earnings accrued from international reserve management.

⁵ MSBs are issued and circulated based on the Bank of Korea Act and the Monetary Stabilisation Bond Act, to control the monetary aggregates.

⁶ FESF is financed by issuing foreign exchange stabilization bonds for the purpose of foreign exchange market stabilisation. MOFE needs permission from the Congress in the process of issuing the bonds because it affects the fiscal balance of the government.

Trends of international reserves

(End of period)



With regard to the second claim, the fact of the matter is that won/dollar exchange rate volatility has increased significantly since adoption of the free floating system. That is, the daily ex post volatilities measured by the differences between each day's and each previous day's closing rates and between the daily highs and lows have both more than doubled compared to the period before introduction of the free floating system.

Trends of daily won/dollar exchange rate volatility

(Period average)

(%)

	Before free floating system ^{1, 3}	After free floating system ^{2, 3}	1998	1999	2000	2001	2002	2003	2004
			Apr - Dec						
Day-on-day percentage change ⁴	0.16	0.36	0.70	0.29	0.28	0.37	0.31	0.29	0.30
Daily percentage change ⁵	0.26	0.59	1.22	0.57	0.46	0.52	0.50	0.45	0.40

¹ 3.1.1995 - 31.10.1997. ² 1.4.1998 - 30.9.2004. ³ Excluding the currency crisis period (1.11.1997-31.3.1998). ⁴ Averaged absolute value of (each day's closing rate - previous day's closing rate)/previous day's closing rate. ⁵ Average of (daily high - daily low)/each day's average rate.

Thirdly, the assertion that the Korean authorities have actively intervened in the market to target an exchange rate sustainable for maintaining price competitiveness is not unambiguous. The nominal effective exchange rate (NEER) indexes show that since 1998 changes in yearly averages have been widening to 5.3%, from 2.0% during the periods before the currency crisis. In 2003 and 2004, the figures represent a stable pattern, implying that the Korean won has kept pace with the movements of other currencies. Similarly, the yearly changes in the real effective exchange rate (REER) indexes have also increased since adoption of the free floating system, while the won has appreciated a bit compared to other currencies since 2002. These figures may imply that the won has not been operated for the purpose of targeting a specific exchange rate level, but that its value has instead been determined in the market, reflecting the global trends of major currencies.

Trends of NEER and REER

(Period average)

(%)

	Before free floating system ^{1,3}				After free floating system ^{2,3}							
		1995	1996	1997 Jan-Oct		1998 Apr-Dec	1999	2000	2001	2002	2003	2004 Jan-Aug
NEER	2.04	0.8	0.2	-4.9	5.34	-18.5	2.6	6.6	-5.9	2.8	-0.3	0.3
REER ⁵	2.34	1.0	1.6	-4.3	5.24	-17.0	2.8	7.6	-3.5	3.4	0.9	1.4

¹ Jan 1995 - Oct 1997. ² Apr 1998 - Aug 2004. ³ Excluding the currency crisis period (Nov 1997 - Mar 1998). ⁴ Figures represent the averages of the absolute values of the yearly appreciation(+) or depreciation(-) ratios. ⁵ CPI-weighted.

2.2 Foreign exchange transaction trends

The daily average turnover of total foreign exchange transactions in the inter-bank and customer markets amounted to US\$ 20.4 billion in the second quarter of 2004, more than double the figure of US\$ 9.2 billion in 2001. The proportion of spot transactions has declined from 58 % to 47 %, while those of forwards, foreign exchange swaps and foreign exchange derivatives have increased.

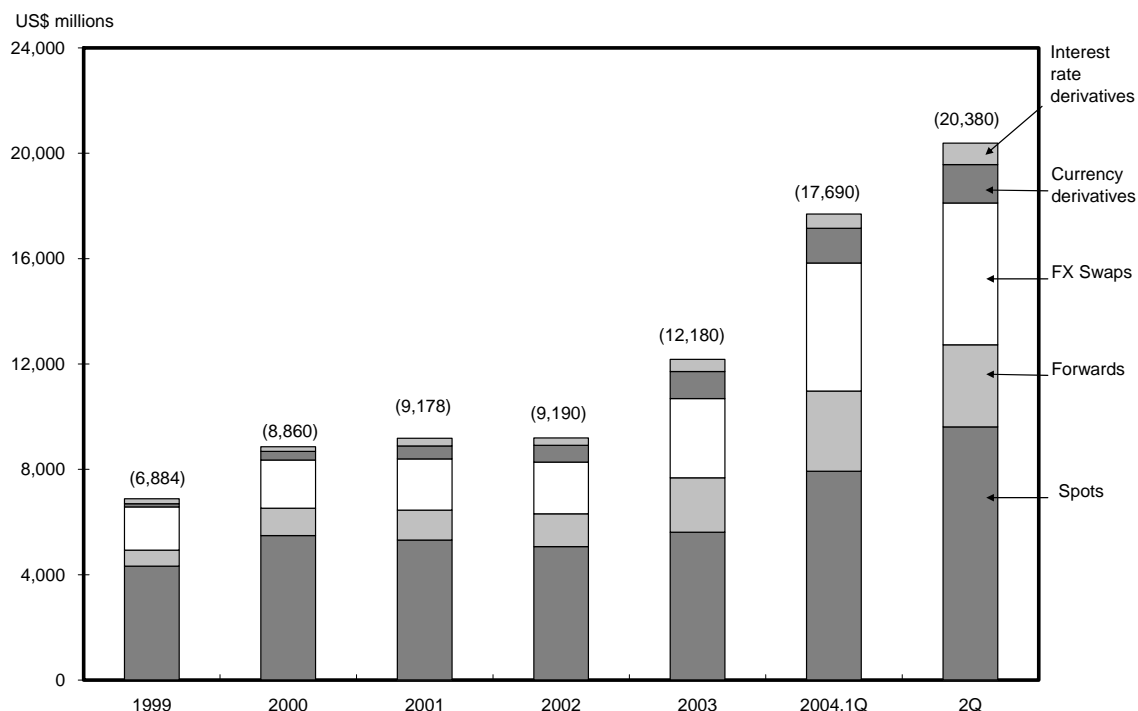
Foreign exchange turnover

(Daily average)

(US\$ 100 m)

	1999	2000	2001	2002	2003	2004	
						1/4	2/4
Spots	43.3	54.9	53.2	50.7	56.1	79.3	96.1
Forwards	6.0	10.4	11.3	12.5	20.7	30.4	31.2
FX swaps	16.5	18.3	19.5	19.6	30.1	48.6	53.8
Traditional FX transactions (A)	65.8	83.5	84.0	82.8	106.9	158.3	181.1
Currency derivatives	1.2	3.3	4.9	6.4	10.2	13.2	14.6
Interest rate derivatives	1.9	1.8	2.9	2.8	4.7	5.4	8.1
FX derivatives (B) ¹	3.0	5.1	7.8	9.1	14.9	18.6	22.7
Total (A + B)	68.8	88.6	91.8	91.9	121.8	176.9	203.8

¹ Equity and credit-related derivatives excluded.



This indicates that the Korean foreign exchange market has been developed in terms not only of its quantity, but also of its quality.⁷ Furthermore, this is mainly attributable to the increase in economic entities' transactions for the purpose of hedging under influence of the authorities' efforts to heighten market functioning of the exchange rate since adoption of the free floating system.

2.3 Determinants of the won/dollar exchange rate

The movement of the won exchange rate against the US dollar is basically influenced by foreign exchange flows including the current account balance, which has shown a surplus since 1998, and foreign portfolio investment in the Korean equity and bond markets. Recently, however, it has been greatly affected by external factors such as the movement of the Japanese yen due to the global trend of the US dollar, and off-shore NDF transactions by non-residents.

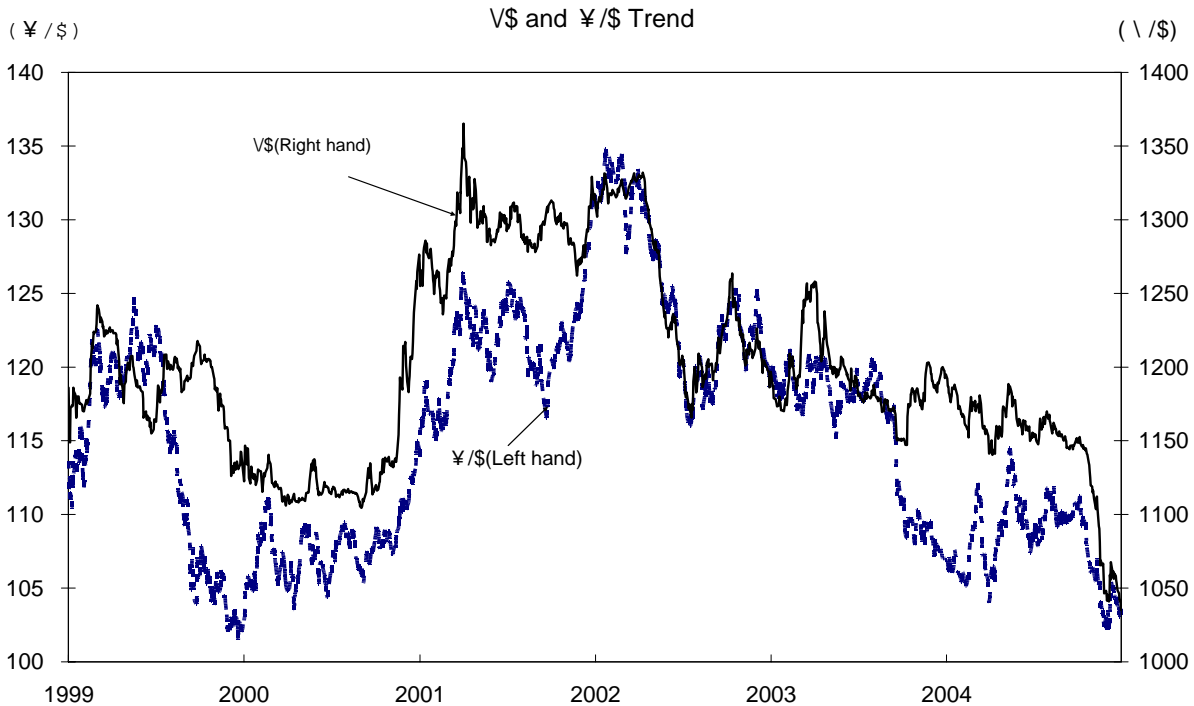
The recent movements of the won/dollar exchange rate have shown a pattern of synchronisation with the fluctuations of the yen against the dollar. This is mainly due to strong market participants' expectations that the won will trace the yen, in light of the intense export competition between Korea and Japan. Looking at the correlation coefficients between the two exchange rates, the co-movement turned out to be particularly noticeable in 2002 and in 2004.

Correlation coefficient between won and yen exchange rate

2000	2001	2002	2003	2004
0.20	0.35	0.77	0.39	0.80

Note: Period average of monthly figures which are calculated using daily data.

⁷ The ratio of the total daily turnover to nominal GDP has increased from 1.2% in 1998 to 3.3% in 2004, while the ratio of the daily turnover to trade has changed from 1.8% in 1998 to 5.4% in 2004.



Considering the intense export competition between the two countries, the won's exchange rate against the Japanese yen is obviously important. In this regard, before the currency crisis period the strengthening of the US dollar (and consequent weakening of the yen) caused an accompanying appreciation of the won and thus impaired Korea's export competitiveness. In contrast, the recent synchronised pattern of the won and yen exchange rate has mitigated the loss of Korean export competitiveness since the strong dollar results in weakening of the yen and won simultaneously (see Annex 1).

In tandem with the movements of the yen, off-shore NDF transactions are also crucial in determining the won/dollar exchange rate. NDF transactions between Korean foreign exchange banks and non-residents have been sharply increasing since they were first allowed in April 1999 as a part of foreign exchange liberalisation in Korea. For example, the daily turnover of NDF transactions between Korean foreign exchange banks and non-residents for the purpose of hedging and speculative demand has increased from US\$ 0.4 billion in 2000 to US\$ 1.5 billion in the third quarter of 2004.

Daily turnover of NDF transactions

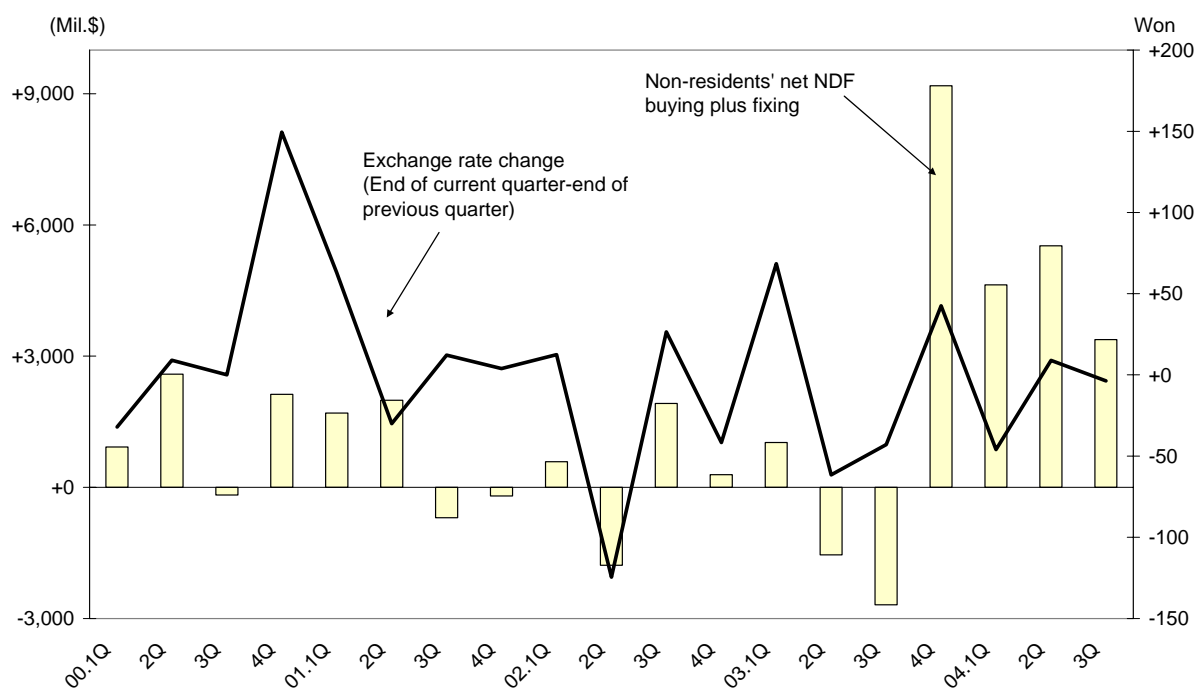
(US\$ 100 m)

2000	2001	2002	2003	2004 ^P		
				1/4	2/4	3/4
4.0	5.1	6.7	13.4	14.4	17.6	15.3

While NDF transactions between Korean foreign exchange banks and non-residents offer a convenient hedging tool, they also provide a chance to trade for speculative purposes and act as one of the significant determinants of the won/dollar exchange rate. For instance, non-residents' buying of dollars in the won/dollar NDF market results in the foreign exchange positions of their counterparty foreign exchange banks being short. The banks then usually take long positions in the spot market to square their exchange risk exposures, causing the won to be depreciated (see Annex 2). Meanwhile, an increase in NDF trading seems to be attributable to the co-movement of the won and yen exchange rates since non-residents normally take changes in the yen/dollar exchange rate as a reference in trading won/dollar NDF. That is, when the yen depreciates against the US dollar, non-residents buy

won/dollar NDFs and cause the won to depreciate. In contrast, when the yen appreciates against dollar, non-residents sell off won/dollar NDFs, bringing about the won appreciation.

Trends of NDF transactions and won/dollar exchange rate



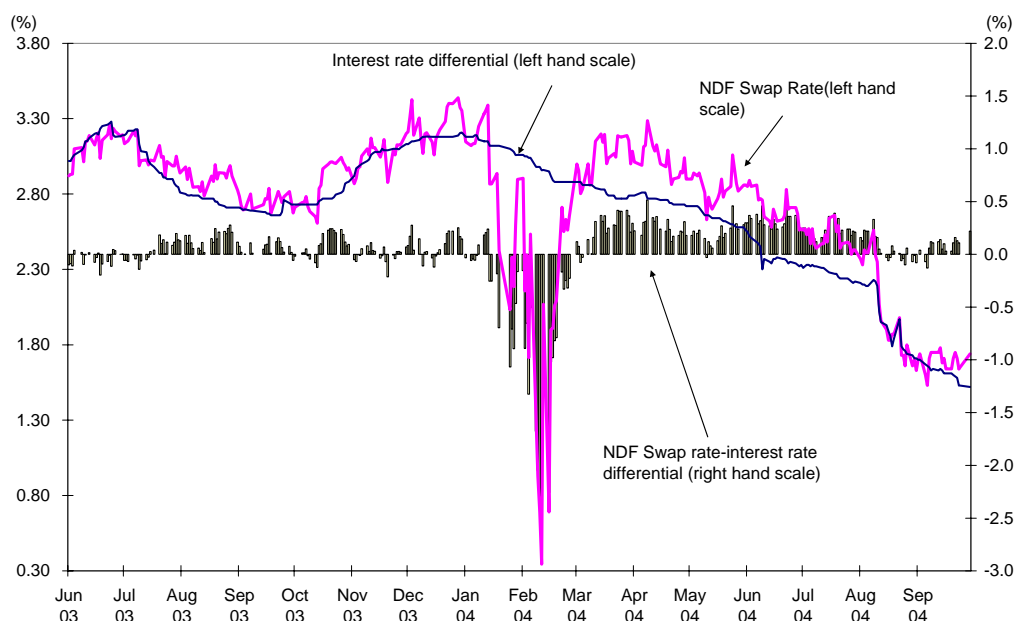
2.4 Regulation on NDF transactions

Under the growing impact of NDFs on the won/dollar exchange rate, non-residents' speculative NDF transactions have been prevalent since late 2003, bringing about a greater possibility of foreign exchange market turbulence. To cope with this, the Korean government implemented regulations on Korean foreign exchange banks' NDF transactions with non-residents in January 2004.

The regulations applied both to banks' overbought and oversold positions. That is, banks' NDF overbought positions resulting from trading with non-residents were required to be 110% or less of their NDF overbought positions as of 14 January 2004, in order to prevent banks from selling in the spot market. In turn, banks' NDF oversold positions resulting from trading with non-residents had to be 90% or more of their NDF oversold positions as of 16 January 2004, to prevent their selling due to NDF fixing. In short, the regulations were intended to prevent foreign exchange banks' buying of NDF, thus limiting excessive selling off by non-residents.

Even though these regulations on NDF transactions succeeded in preventing speculative NDF trading by non-residents and in stabilising the market, they also resulted in shrinkage of the NDF trading, in widening the gap between on-shore and off-shore swap rates, and in an increase in banks' losses from NDF transactions with non-residents. For instance, the off-shore swap rates dropped sharply to 0.34% on 12 February 2004 from 3.35% at the end of 2003, while the on-shore swap rates remained stable. The decline in the off-shore swap rate resulted in losses for foreign exchange banks from compulsory NDF trading with non-residents, while reducing the borrowing costs paid by non-residents.

NDF swap rate and interest differential



Furthermore, the decline of the swap rates below the interest rate differentials (domestic minus international interest rates) brought about hasty and massive capital inflows to the domestic bond market, magnifying uncertainties concerning capital flows. In other words, foreigners invested in domestic bonds such as government bonds and monetary stabilisation bonds, after raising domestic funds by foreign exchange swaps. The amount of bond investment during the period from 16 January to 20 February was estimated at US\$ 1.4 billion, surpassing the entire annual amount in 2003 of US\$ 1.0 billion.

Net investment flows into domestic bonds since NDF regulation

(US\$100 m)

2001	2002	2003	04.1.1 - 1.15	1.16 - 2.20	2.21 - 2.28	Mar - Apr
1.2	3.6	9.7	0.4	14.2	1.2	1.7

Note: Figures for 2004 are preliminary.

For these reasons, the regulations were gradually loosened and then abolished in April 2004, since the Korean government judged that speculative trading by non-residents had abated. Specifically, the banks' oversold position limit of 90% was reduced to 60% on 20 February and to 30% on 20 March. Finally, the swap rate recovered its ordinary level after the government abolished the oversold position limit on 20 April 2004.

3. Implications for future exchange rate operations

Since adoption of the free floating exchange rate system, the Korean authorities have actively endeavoured to achieve stabilisation of the foreign exchange market. In the process of overcoming the currency crisis, the Korean authorities tried to expand the nation's international reserves. Recently, they intervened in the foreign exchange market to smooth the pace of exchange rate changes resulting from over-supply of foreign exchange due to the current account surplus, from the whimsical movements of major currencies, and from non-residents' speculative trading in the off-shore NDF market.

Considering Korea's thin foreign exchange market as a small open economy, and the vulnerability of the won exchange rate to diverse external shocks and the changing global environment, the Korean authorities' efforts to stabilise the exchange rate could be regarded as inevitable. From a future policy perspective, however, it is more desirable to let the exchange rate be determined in the market, reflecting the economic fundamentals and foreign exchange flows. This seems to be a prerequisite for building up a mechanism for the self-regulation of exchange rate fluctuations and developing the foreign exchange market by encouraging autonomous foreign exchange trading.

In the case of a radical and unexpected change in the exchange rate, or of an existence of one-sided exchange rate expectations due to transient external shocks, the authorities will inevitably implement smoothing operations. Furthermore, to achieve the goals of exchange rate operations, it also seems to be indispensable for any speculative attacks to be swiftly dealt with as they increase the possibility of foreign exchange market turmoil. Furthermore, enhancement of the authorities' credibility and transparency in exchange rate operations is also an essential objective.

Annex 1: The effect of US dollar and Japanese yen on Korean won

The results of an empirical test using daily data indicate that before the adoption of the free floating exchange rate system (March 1990 - October 1997) the effect of the US dollar on the won showed plus sign and was statistically significant. Since adoption of the free floating system (April 1998 - March 2002), however, the impact of the Japanese yen on the won has become more crucial than that of the US dollar.

- Equation: $\log(\text{Won}/\text{CHF})_t = \alpha_0 + \alpha_1 \log(\text{US}\$/\text{CHF})_t + \alpha_2 \log(\text{Yen}/\text{CHF})_t + \varepsilon$

- Frequency: daily data

Sample period	α_0	α_1	α_2	R bar ²	F-value
Mar 1990 - Oct 1997	8.02 (39.67) ^{***}	0.94 (15.69) ^{***}	-0.31 (-6.87) ^{***}	0.752	142.3
Apr 1998 - Mar 2002	3.72 (7.94) ^{***}	0.21 (1.41)	0.70 (7.32) ^{***}	0.793	82.8

Notes: 1) Figures in parentheses indicate t values. 2) ^{***}, ^{**}, ^{*} indicate significance levels of 1%, 5% and 10%, respectively. 3) Won: Korean won, CHF: Swiss franc, Yen: Japanese yen.

Annex 2: The effect of off-shore NDF transactions on the won/dollar exchange rate

Using GARCH (Generalised ARCH) models, the effect of off-shore NDF transactions on the won/dollar exchange rate is tested. The empirical results show that the won/dollar exchange rate shows positive signs (indicating a weakening of the won) in reaction to depreciations of the yen and to non-residents' buying of won/dollar NDFs, while showing negative signs in reaction to foreign investment in domestic stocks, as expected. In addition, an increase in NDF transactions enlarges exchange rate volatility, as the coefficient α_3 shows statistically significant positive signs. This implies that the won/dollar exchange rate has been greatly influenced recently by external factors such as the movement of the yen against the US dollar and off-shore NDF transactions by non-residents.

- Equation:
$$s_t = \beta_0 + \beta_1 s_{t-1} + \beta_2 \text{yen}_t + \beta_3 \text{ksi}_t + \beta_4 \text{ndf}_t + \varepsilon_t$$

$$\varepsilon_t \sim (0, \sigma^2)$$

$$\sigma^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \alpha_3 |\text{ndf}|$$

- Sample period: 1 Jan 2000 - 22 Oct 2002

- Frequency: daily data

	Equation 1	Equation 2	Equation 3
β_0	1.89 (0.89)	-49.50 (-3.22)***	-83.05 (-4.78)***
β_1	0.99 (587.8)***	0.99 (248.9)***	0.97 (176.9)***
β_2		13.81 (3.35)***	30.04 (5.34)***
β_3			-3.73 (-3.99)***
β_4	0.012 (13.57)***	0.012 (13.19)***	0.012 (12.83)***
α_0	-0.81 (-2.52)**	-0.73 (-2.17)**	-0.69 (-2.06)**
α_1	0.24 (5.87)***	0.29 (5.60)***	0.27 (5.58)***
α_2	0.69 (18.13)***	0.63 (13.37)***	0.64 (13.74)***
α_3	0.021 (7.49)***	0.024 (6.81)***	0.024 (7.21)***
Adjusted R ²	0.996	0.996	0.996
DW	1.93	1.90	1.93

Notes: 1) Figures in parentheses indicate t value. 2) ***, **, * indicate significance levels of 1%, 5% and 10%, respectively. 3) s: closing rate of won/dollar exchange rate in log transformation; yen: yen/dollar exchange rate in log transformation; ksi: KOSPI (Korean Stock Price Index) in log transformation; ndf: non-residents' net buying of NDFs; |ndf|: absolute value of non-residents' NDF transactions.

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Central banking intervention under a floating exchange rate regime: ten years of Mexican experience

José Julián Sidaoui¹

1. Introduction

From December 1994 to date, the Mexican peso/US dollar rate has been determined by market forces under a floating regime. During this time span the exchange rate has suffered severe shocks, coming both from the domestic economy (the 1995 crisis) and from the rest of the world (Asian, Russian and Brazilian crises, 11 September 2001 and the Iraqi war). The flexibility of the exchange rate has helped to soften the effects of these shocks. However, the main support of the exchange rate stems from the perceived soundness of Mexico's macroeconomic fundamentals and from the financial authorities' commitment to avoid discretionary interventions. In this regard, as will be shown in this document, in implementing foreign exchange policy Banco de México has adhered to two main principles: (1) not to interfere with the normal functioning of the market and (2) to foster the development of the market through the creation of new instruments and by encouraging the entrance of new participants.

The paper is organised in five sections. The first reviews the context under which the Mexican financial authorities decided to implement a floating exchange rate regime and discusses the general strategy of the policy decisions that provided a foundation to the regime. The second part describes Banco de México's foreign exchange intervention mechanisms that have been in place during the last ten years. The consistency of the operational procedures with the floating exchange rate regime is emphasised. The third describes the development of the foreign exchange markets in which the Mexican peso is traded, while the fourth section is focused on evaluating the macroeconomic performance of Mexico under the floating exchange regime and the compatibility of the regime with monetary policy under inflation targeting. Finally, some concluding remarks are advanced in the last section.

2. Setting up the foundations of a floating exchange rate regime

2.1 General strategy

The Mexican financial authorities were forced to let the peso float in December 1994 after it became evident that the pegged exchange rate against the US dollar (US\$), which had been in place since 1987, was untenable. Efforts to defend the pegged exchange rate had caused the depletion of net international reserves and the accumulation of large amounts of short-term liabilities denominated in foreign currencies. In that context, some economic analysts feared that a floating exchange rate would be an additional source of volatility and undermine the effectiveness of macroeconomic stabilisation policies.² However, Banco de México was convinced that the float had important advantages, such as discouraging short-term capital flows as well as being a useful indicator both of market perceptions and of inflationary pressures to guide monetary policy. Notwithstanding the skepticism about the floating exchange rate, from the onset of 1995 Banco de México started to implement a series of policy actions aimed at strengthening the foreign exchange market.

Foreign exchange policy in Mexico has indeed evolved in the course of the last decade. Nevertheless, from the initial discretionary interventions of 1995 to the current policy based on automatic

¹ Deputy Governor, Banco de México. The views and conclusions presented here are exclusively those of the author and do not necessarily reflect those of Banco de México or of other board members.

² Most of the arguments against the floating regime are mentioned in Sidaoui (2003).

mechanisms, the overall strategy continues to stress the need to minimise interference with the foreign exchange market and to foster its development.³ This strategy is based on the belief that a foreign exchange market that is able to function properly, that is, a deep and liquid market where prices are always provided, is the fundamental underpinning of a floating exchange regime. Without a well functioning market, a floating regime could indeed become a source of volatility and other distortions. It is under this basic philosophy that one can understand, for instance, the facilities established in 1995 to provide liquidity assistance in foreign currency to Mexican commercial banks and to pay off Tesobono-holders directly in US\$. The idea was to isolate these significant demands for foreign exchange in order to stabilise the market and to limit speculative opportunities that could distort the formation of prices. Hence, these windows allowed the foreign exchange market to be more competitive by providing a level playing field for all participants. A similar rationale lies behind the policy of keeping most foreign exchange operations of public sector entities out of the market.

Moreover, the sporadic episodes of direct intervention by Banco de México in the foreign exchange market in 1995 and 1998 can be better understood in the context of the latter strategy. In both instances the intervention was motivated by the belief of the financial authorities in the advisability of bursting speculative bubbles in the foreign exchange market. The objective of discouraging sharp speculative positions against the Mexican peso was not limited only to infrequent foreign exchange market intervention, but rather also was complemented by a restrictive monetary policy stance.

So it is clear, as is the case for any other country with a flexible exchange rate, that the float in Mexico has not implied that the monetary authorities refrain from intervening in the foreign exchange market. On the contrary, intervention has to be understood from the standpoint of a policy designed to improve, paradoxically, the operation of market forces in the determination of the exchange rate.

Strangely enough, one of the sources of speculation in the foreign exchange market (particularly during the early years of the floating regime) was the perceived reluctance of the central bank to intervene. This perception related to the reduced levels of international reserves at the time. Thus, in order to contain speculative pressures, the financial authorities pursued from 1996 to 2001 a policy of replenishing the stock of international reserves.

Foreign exchange intervention per se was not sufficient to foster the development of the foreign exchange market. In addition, a stable and sound macroeconomic environment was needed to reduce uncertainty and market turbulence. In fact, one of the immediate policy goals for 1995, ensuring the solvency of the government, was attained by securing an international financial assistance package, refinancing foreign liabilities, controlling expenditures and increasing fiscal revenues. Moreover, a policy of institutional reform of financial markets and a strategy of information disclosure were introduced in order to support market development.

To strengthen the floating exchange rate regime the central bank recognised the significance of improving the operation of the market. Thus, in 1995 the financial authorities pushed an additional deregulation effort focused on allowing new financial instruments.⁴ Steps in this direction were taken with the futures and options markets. Specifically, in April 1995 Banco de México authorised: (1) the operation of foreign exchange markets dealing in US\$ derivatives involving Mexican pesos and (2) deposits in local currency with foreign financial institutions. The main rationale for this was that derivatives contribute to trade and hedge specific risk exposures, allowing the spread of risk among different players and hence mitigating the uncertainty regarding the exchange rate. Furthermore, exchange rate linked derivatives serve to complement the available money market instruments by providing a yield curve implicit in futures and forward contracts and therefore supports a consistent alignment of prices in financial markets.

Banco de México's authorisation to operate derivatives allowed the Chicago Mercantile Exchange (CME) to launch a Mexican peso futures contract, which was the first emerging market product of its

³ Foreign exchange policy in Mexico is set by the Foreign Exchange Commission, composed of three members of the Secretaría de Hacienda y Crédito Público (MoF) and three members of Banco de México. The MoF has control over the commission since the Secretary casts the deciding vote in case of a tie and any official decision must have the vote of at least one member of the MoF. Banco de México is responsible for implementing the foreign exchange policy.

⁴ Since 1988 Banco de México embarked on an ambitious deregulation and modernisation process of the financial system. This process was focused on abolishing foreign exchange controls, allowing foreign investment in the equity and money markets, eliminating credit rationing and interest rate limits and easing legal reserve requirements.

kind to be traded on the Exchange. Once a solid volume for the Mexican peso futures was attained, the CME introduced options on futures contracts, thus widening the investment alternatives open to market participants. These choices were further expanded with the launching of the Mexican Market of Derivative Products (Mexder), which in December 1998 began the operation of a futures contract involving the Mexican peso against the US\$.

Banco de México also supported the development of foreign exchange derivatives through regulation and supervision of the over-the-counter forward market. In this regard, the central bank allowed banks which complied with a set of specific requirements - financial strength, evaluation and control of market and credit risks, as well as proper systems to monitor such risks - to carry out forward foreign exchange transactions. A further step in market development was the decision to modify in 1996 the computation of the Fix exchange rate, a quote published by the central bank that is widely used as a reference, to better reflect actual market conditions.

Banco de México also implemented a policy of information disclosure which indirectly contributed to the objective of developing the financial markets. Authorities acknowledged that timely information was a fundamental input for market participants in order to adequately evaluate the prevailing macroeconomic conditions and, specifically, the conduct of monetary policy. In this regard, from April 1995 on, Banco de México has been issuing a press release presenting, among other data, the main items of its balance sheet. In particular, the press release also includes a breakdown of the factors that explain the weekly flow of international reserves. This policy of transparency was in sharp contrast with the previous practice of reporting the stock of international reserves only thrice a year.

The final institutional reform that buttressed the floating exchange regime was the adoption of an inflation targeting framework in 2001. This decision made clear that Banco de México would conduct monetary policy aimed at achieving price stability, following an integral approach to the analysis of the determinants of inflation. Thus, the focal role that the exchange rate had enjoyed in the determination of the price level was further diminished, which in turn allowed monetary policy to concentrate on a broader set of fundamental factors affecting inflation. Moreover, the adoption of this framework included all the typical transparency and accountability elements that have become the international standard.

2.2 International reserve accumulation

Banco de México accumulated US\$ 59.1 billion of net foreign assets in the period 1996-2003. As shown below, this substantial accumulation was achieved without causing severe distortions to the foreign exchange market or altering in any significant way the nature of the flexible exchange rate regime.

As pointed out in Sidaoui (2003), the Mexican financial authorities decided to build up international reserves after a careful assessment of the benefits and costs of this action, in the context of institutional constraints imposed by Banco de México's operational framework with public sector entities. The rationale behind reserve accumulation went beyond ensuring compliance with Mexico's foreign external obligations. In light of the skepticism regarding Mexico's ability to put its house in order, it focused on preventing the 1995 liquidity crisis from becoming a fully fledged solvency crisis. Reserve accumulation was also a signal to investors and international rating agencies that associate a higher level of international reserves with lower country risk. Consequently, a large stock of international reserves would be a positive externality, since all Mexican borrowers could gain access to foreign financing on better terms. A further argument in favour of holding a larger stock of international reserves emerged as the 1995 crisis unfolded, when the central bank was compelled to intervene in the market to put a lid on speculative pressures on the peso, which were fed by a perceived unwillingness to intervene given the low level of available reserves.

As argued by Sidaoui (2003), the accumulation of international reserves was not costless. On the one hand, it had implications for the implementation of open market operations aimed at regulating money market liquidity. As the central bank's international reserves went up, so did the amount of liquidity that had to be sterilised. By April 1997 international reserves, measured in pesos, were larger than the stock of base money. As the accumulation moved forward, the monetary authorities had to devise more effective means to nullify the monetary impact of its purchases of foreign currencies. On the other hand, reserve accumulation also entailed costs for the financial performance of Banco de México. First of all, given that domestic interest rates have been above international rates, the liabilities in pesos incurred by the central bank have an impact on interest costs in excess of the

returns obtained from investing the stock of international reserves. Furthermore, as the exchange rate fluctuates, so does the value in pesos of a given stock of international reserves, affecting the financial results of Banco de México adversely during periods of exchange rate appreciation.

During the past four years, after receiving an investment grade status from major rating agencies and given the steady improvement of the external debt profile for both the public and private sectors, it has been evident that the costs of holding an increasing stock of international reserves are rising faster than the benefits. Taking this into account, the Mexican financial authorities decided in May 2003 to implement foreign exchange policy actions aimed at slowing the pace of accumulation. Those actions have followed the same intention of not interfering with the normal functioning of the market, while mitigating the costs stemming from marginal increments in international reserves. Nonetheless, no targeted level for international reserves has been specified by the Mexican financial authorities. Even though policy in practice follows the principle that “the more, the better”, it does not pursue as fast a pace of accumulation as it did between 2000 and 2002.

3. Foreign exchange intervention under a floating regime

Intervention by Banco de México has almost exclusively relied on either indirect means (foreign exchange operations with public sector entities and the special US\$ facilities opened in 1995) or automatic schemes (intervention oriented to stabilising markets and to managing the stock of international reserves). The former has mostly taken the form of keeping large public sector players away from the market in order to achieve a more competitive outcome. Regarding direct intervention in the foreign exchange market, it has almost solely been based on rules which are announced ex-ante. The only exceptions have been the discretionary interventions decreed by the Foreign Exchange Commission in 1995 and 1998, which were promptly acknowledged by the financial authorities. These rare instances of direct discretionary intervention on the foreign exchange market have taken place only when it appears to be unavoidable, given market conditions of heavy speculation against the currency. Furthermore, with view to consolidating market credibility, the authorities' commitment to the floating regime has been frequently emphasised, as has their decision to conduct monetary and exchange rate policies transparently.

3.1 Modalities of discretionary intervention

3.1.1 Foreign exchange operations with public sector entities

Acting as its financial agent, Banco de México conducts foreign exchange transactions with the federal government, while it also operates with Pemex, the state-owned oil enterprise.⁵ Given the large size and, very often, predictable timing of the foreign currency operations of these two entities, the Foreign Exchange Commission deemed it advisable to prevent them from taking place directly in the foreign exchange market and cause unwarranted volatility. Thus, by removing the operations of the largest public sector entities from the market (and being transparent about it), the authorities minimise the suspicion of carrying out foreign exchange operations with the aim of attaining certain exchange rate objectives, while allowing a more competitive functioning of the foreign exchange market. Moreover, the two entities have opposite foreign exchange positions so it is natural and easier to manage them outside the market.

The specific strategy that Banco de México applies when dealing with public sector entities relies on the use of international reserves as a buffer stock. Hence, Pemex's net foreign exchange receipts (from oil exports and external financing) have been partially used to finance the federal government's foreign exchange requirements to service its external debt. Since Pemex's receipts have usually exceeded the federal government's external debt servicing needs, the central bank has ended up with a larger stock of international reserves. Operations with these two entities are undertaken in market

⁵ In fact, the central bank maintains exchange controls over Pemex, the only public sector enterprise deemed large enough to merit them after the liberalisation that started in 1988.

terms, with previous notice for foreign exchange transactions and at rates very similar to the Fix exchange rate.

Foreign exchange operations conducted by Banco de México with public sector entities over the course of several years have been the most significant source of international reserve accumulation (Table 1).

Table 1
Flows of net foreign assets: decomposition by source, 1996-2004

Billions of US dollars

	Total	Pemex	Federal government	Market operations	Others¹
1996	6.3	9.0	-2.7	0.9	-0.9
1997	13.5	8.5	0.9	3.8	0.4
1998	3.7	5.4	-3.3	0.3	1.2
1999	3.9	7.4	-6.5	1.8	1.2
2000	8.2	11.2	-6.8	1.8	2.1
2001	9.2	8.9	-2.4	1.4	1.4
2002	5.9	10.0	-6.2	0.0	2.1
2003	8.3	15.4	-5.8	-3.2	2.0
2004	5.2	13.8	-3.2	-6.7	1.3

¹ Includes net income generated by investing Banco de México's international assets.

Source: Banco de México.

3.1.2 Creation of temporary US dollar facilities in 1995

As mentioned above, during the first months of 1995 Banco de México took a series of policy actions intended to strengthen the floating exchange rate regime. In this regard the central bank decided to deal directly with two important sources of foreign currency demand which might have exacerbated the speculative pressures against the Mexican peso: (1) the closing of credit lines to Mexican commercial banks and (2) the amortisation of Tesobonos (US\$-indexed government securities). The early interventions of 1995 were oriented towards stabilising the foreign exchange market and easing speculation against the peso, in order to limit undue volatility during the resolution of the crisis.

The main trigger of the 1994-95 crisis was a sudden interruption and later reversion of the foreign capital inflows which had come to Mexico after the external debt renegotiation and financial liberalisation of 1990. In particular, the Mexican commercial banks' foreign liabilities followed a similar pattern to other types of financial capital flows. The outstanding stock of such liabilities more than doubled from 1990 until July 1994 and remained relatively stable during the second semester of that year (Graph 1). However, following the elimination of the pegged exchange regime, most Mexican commercial banks faced great difficulties in rolling over their foreign liabilities because their credit lines with foreign financial institutions were suspended. This situation was evidenced by the reduction of around US\$ 5.1 billion in the stock of foreign liabilities at the end on 1995, which represented a fall of more than 20% from the level observed the previous year.

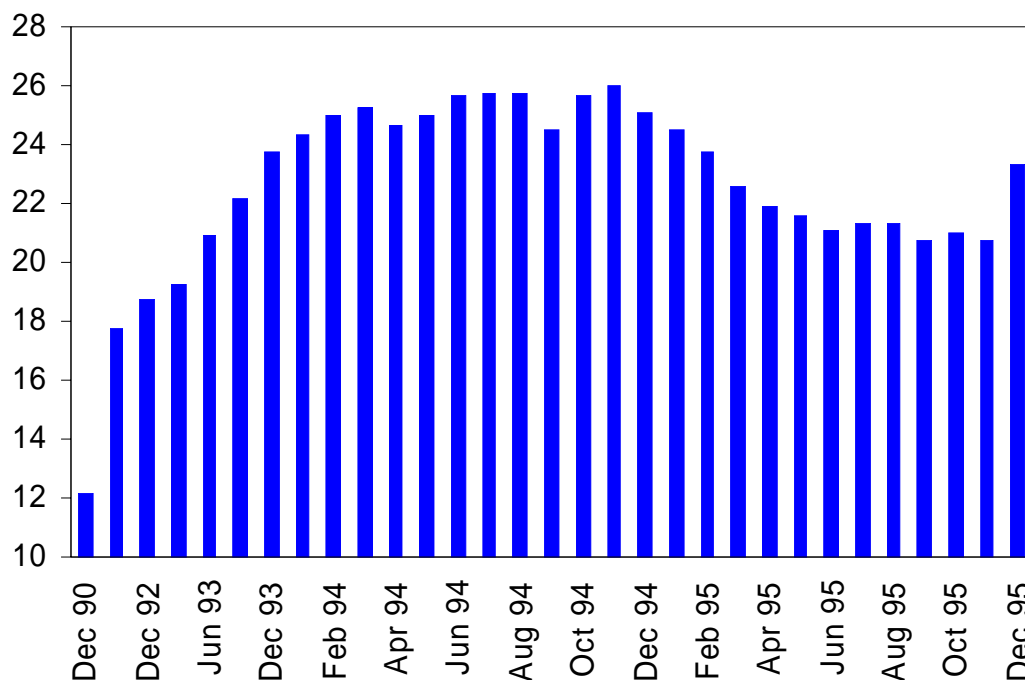
The liquidity problem faced by the Mexican commercial banks during the first months of 1995 differed from the common textbook case of a central bank acting as a lender last resort. Banks required foreign currency, not pesos. By definition a central bank has a limited stock of international assets which may be used to intervene in the foreign exchange market to deal with temporary balance of payments strains. Consequently, establishing an emergency liquidity facility in US\$ was a risky decision, specially when considering the size of the stock of banks' foreign liabilities relative to the stock of the international reserves (US\$ 6.2 billion at the end of December 1994). On the other hand, it was difficult to satisfy the banks' demand for US\$ in the foreign exchange market without compounding the

depreciation pressures faced at that time. To cope with this dollar liquidity problem, an emergency facility was designed to stop and eventually reverse the run on the external liabilities of commercial banks. To this end, Banco de México implemented a mechanism of US\$ loans granted to the deposit insurance fund (FOBAPROA), which in turn allocated the funds to the commercial banks that requested assistance. Commercial banks pledged assets as collateral on the credits obtained through this facility. Loans carried high interest rates to prevent a moral hazard bias, since banks had the incentive to pay back such liabilities as soon as possible. In the event, 17 banks obtained assistance through this facility. At its peak, in April 1995 the outstanding loans granted by Banco de México amounted to US\$ 3.9 billion (Graph 2). This facility was successful and short-lived, since debtor banks paid off their debts in full by September 1995 (the window was to remain open for only nine months).

Regarding the second source of foreign currency demand, the most severe financial problem faced by the Mexican economy during the 1994-95 crisis was the amortisation of Tesobonos, amounting to US\$ 29.2 billion, which took place during 1995. Tesobonos were zero-coupon bonds issued by the Mexican government which paid the amount of pesos required to buy a fixed quantity of US\$, as specified in the face value of the instrument. By their risk profile, Tesobonos were equivalent to a US\$ denominated instrument, even though payment flows were settled in Mexican pesos. In particular such payments introduced an important source of instability to the foreign exchange market, since bondholders became indifferent to any peso depreciation induced by their demand for US\$. Given that a significant stock of Tesobonos matured each week, it was perceived that their amortisation would generate persistent depreciation pressures. To cope with this Banco de México was initially forced to intervene in the foreign exchange market, selling almost half of the US\$ demanded for the amortisation payments from January to March 1995 (Graph 3).

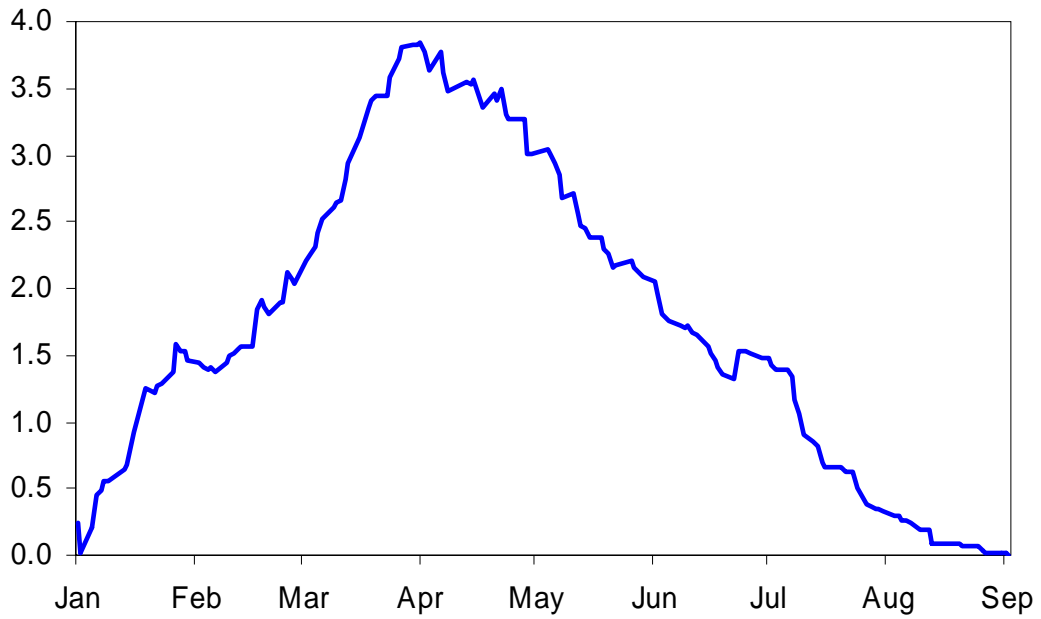
Graph 1
Foreign liabilities of commercial banks, 1990-95

Stocks in billions of US dollars



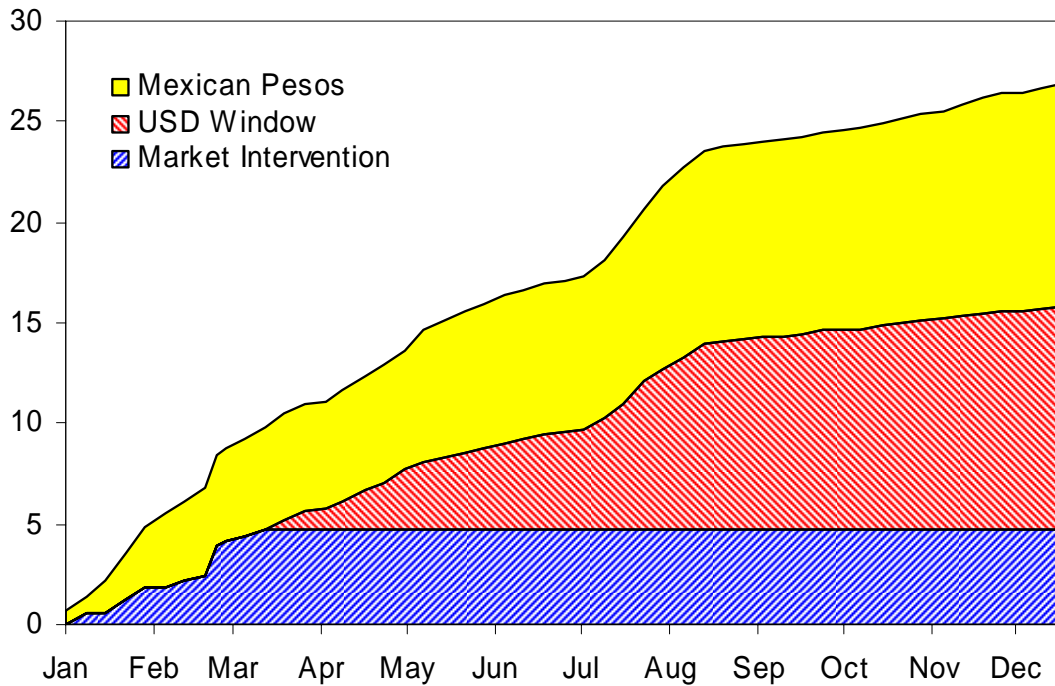
Source: Banco de México.

Graph 2
Banco de México's emergency liquidity assistance in US dollars, 1995
 Stocks in billions of US dollars



Source: Banco de México.

Graph 3
Payment sources for the amortisation of tesobonos, 1995
 Cumulative flows in billions of US dollars



Source: Banco de México.

However, in the process of carrying out these interventions the central bank induced some distortions which, to the extent that some market participants took advantage of them, caused the foreign exchange market to respond mainly to speculative behaviour. In order to deal with this problem, in March 1995 Banco de México decided to: (1) refrain from intervening in the foreign exchange market and (2) open a special facility for amortising Tesobonos at the holder's request. This facility was successful since it eliminated an important source of uncertainty in financial markets. During the lifetime of this facility, close to 65% of the Tesobonos' nominal value was paid off directly in US\$.

3.1.3 Discretionary intervention in the foreign exchange market

In the midst of severe speculation against the peso, the Foreign Exchange Commission instructed Banco de México to undertake discretionary sales of US\$. Interventions were carried out through market procedures on four occasions between November and December 1995 and on one day in September 1998. Furthermore, in the spirit of enhanced transparency, the precise amounts of the foreign exchange intervention were revealed by Banco de México at the end of the day.

As for the factors that caused the interventions of 1995, from the onset of the fourth quarter market participants were concerned about whether or not the Mexican economy would be capable of attaining in future a recovery pace similar in magnitude and intensity to the real contraction experienced during 1995 (annual GDP variation of -7%). Furthermore, uncertainty was fuelled by the perception that Banco de México had no degrees of freedom to offset any severe US\$ demand pressure, because its stock of international reserves (US\$ 14.7 billion as of September 1995) was significantly smaller than the central bank's foreign liabilities with the IMF and the financial authorities of the United States and Canada (US\$ 16.9 billion). Under these circumstances the foreign exchange market tended to respond mainly to speculative factors, so that agents leaned towards long US\$ positions. The magnitude of these speculative positions was reflected in an almost continuous weakening of the Mexican peso. By mid-November 1995 the depreciation added up to more than 25% with respect to end-September.

In this context and notwithstanding the relative scarcity of international reserves, as well as the intention to refrain from discrete interventions, the financial authorities decided that the most suitable use of the stock of international assets under a floating exchange regime was to offset a speculative bias like the one then being experienced. In particular, during the last two months of 1995 Banco de México intervened four times, selling a total of US\$ 0.5 billion. These interventions were accompanied by a more restrictive monetary policy stance which induced a rise of 10 percentage points in the interbank interest rate between the first and second halves of the fourth quarter of 1995. The tighter monetary policy stance was intended to make the funding of long US\$ speculative positions more expensive, and force market participants to face the consequences of their market risk exposure measured in Mexican pesos.

Another bout of speculation moved Banco de México to implement its only discrete intervention after 1995, which took place on 10 September 1998, and involved sales of US\$ 0.3 billion. This intervention was also carried out on the instructions of the Foreign Exchange Commission in the light of the volatility in financial markets during the Russian and Long Term Capital Management (LTCM) crises. During this episode, market participants engaged in (imperfect) hedging positions in the Brazilian real with the Mexican peso. As in the previous episode, intervention was coupled with a restrictive monetary policy stance that induced interest rates to go up some 12 percentage points between July and September 1998.

3.2 Automatic mechanisms⁶

There are three discernible stages in this type of intervention: the first was a time for inducing stability in foreign exchange markets and facilitating the accumulation of reserves (1995-2001), the second a period of non-intervention (2001-03) and the third a phase of slowing down the pace of reserve accumulation (2003 to the present).

⁶ The automatic mechanisms are described in more detail in Sidaoui (2003).

3.2.1 *Inducing stability and facilitating reserves accumulation (1995-2001)*

In 1996 the financial authorities stressed the need to build up the stock of international reserves. To this end, in August 1996 the Foreign Exchange Commission announced the implementation of a scheme to buy US\$ through put options, which gave commercial banks the right to sell US\$ to Banco de México, provided certain conditions were satisfied. The objective was to accumulate international reserves beyond the flows obtained through foreign exchange operations conducted with public sector entities.

The options strategy enabled the central bank to increase international reserves without exerting undue pressure on the foreign exchange market or sending equivocal signals that could interfere with the proper functioning of the floating exchange rate regime. The aim was to purchase US\$ when the supply was relatively plentiful and to refrain from doing so when the exchange rate was under depreciating pressures.

The put options programme successfully attained its objectives. From August 1996 to June 2001 Banco de México accumulated US\$ 12.2 billion of international reserves through this mechanism, an amount equivalent to 75% of the total options auctioned. Put options contributed almost one third of the increase in international reserves during the aforementioned period.

In order to minimise the impact of the options scheme on the foreign exchange market, an opposite kind of intervention was designed to endow the process with some degree of symmetry. Thus, in February 1997 the Foreign Exchange Commission authorised Banco de México to undertake daily sales of up to US\$ 0.2 billion to market participants through auctions. This mechanism was aimed at mitigating the volatility in the foreign exchange market by providing liquidity during days when uncertainty prevailed, thus discouraging some participants from engaging in speculative strategies.

Resort to the auction facility to sell US\$ to participants in the foreign exchange market was infrequent. This was so because only under fairly atypical conditions does the exchange rate depreciate by at least 2% in a single day, the minimum depreciation to kickin the auction. In fact, the sales facility was activated on only 14 days during its lifetime. Furthermore, almost 60% of total sales took place from August 1998 to January 1999, which was a period characterised by very high volatility in international financial markets. Because liquidity was provided to the foreign exchange market in a timely way during episodes of turbulence, it can be said that this strategy was also successful.

The net accumulation of international reserves obtained through the use of automatic mechanisms is presented in Table 1. In particular, it is important to underline that nearly 16% of the US\$ acquired by Banco de México through the exercise of put options was recycled to the foreign exchange market via the auctioned sales.

3.2.2 *Non-intervention (2001-03) and slowing the pace of reserves accumulation (2003-to date).*

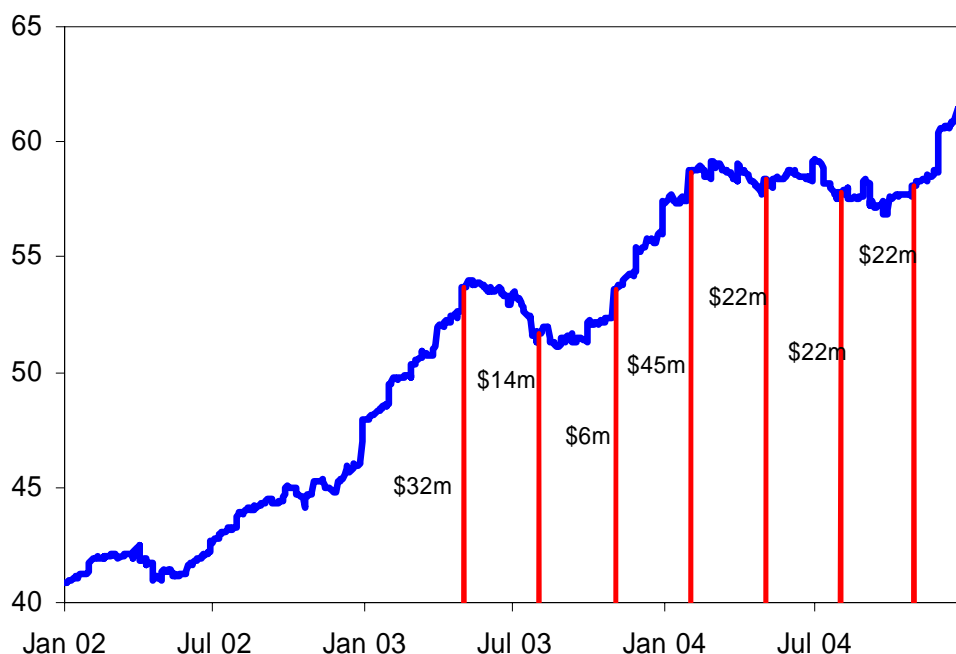
Through its policy of international reserve accumulation Banco de México purchased more than US\$ 38 billion up to March 2001. However, the trend of such purchases and the implications of funding the corresponding peso balances motivated an analysis of the benefits and costs of continuing with the strategy. The results of such an appraisal indicated that the benefits of holding an ever larger amount of international reserves were not as compelling as before. This was mainly because Mexico had just obtained an investment grade status from all major credit rating agencies and the external debt profile of both the public and private sectors had persistently improved during the previous years. Cost considerations became more relevant, not just those stemming from the sterilisation policy itself but also the opportunity costs of the foreign resources accumulated as international reserves. Therefore, the Foreign Exchange Commission decided to suspend both the put option and the sale of US\$ schemes, effective June and July 2001, respectively, thereby leaving the exchange rate essentially free to float.

Nonetheless, international reserves continued rising, reaching US\$ 48 billion bUSD by December 2002 and clearly indicating that terminating the put option mechanism to slow the pace of accumulation was insufficient. As explained in Sidaoui (2003), this result was mainly associated with the constraints imposed by the institutional arrangement for the foreign exchange operations of Banco de México with Pemex. In particular, starting in 1999, Pemex has obtained foreign financing for PIDIREGAS, investment projects that have special off-budget treatment because of their long-term horizon and high rate of return.

Taking into account the projected international reserve flows to be derived mainly from transactions with Pemex, relevance was added to arguments stressing that the marginal costs of additional accumulation were now rising faster than the corresponding marginal benefits. Consequently, the Foreign Exchange Commission moved to implement an automatic mechanism in the foreign exchange market, starting May 2003, with the aim of further dampening the pace of international reserve accumulation. It is important to stress that by introducing this mechanism the Mexican financial authorities neither adopted a target nor defined an optimal level for international reserves. Instead, the objective was to return a fraction of the marginal accumulation of reserves to the market in order to contain the financial and opportunity costs of additional foreign currency holdings.

The objective of slowing the pace of accumulation has been pursued by Banco de México by selling, through daily auctions, a fixed amount of US\$ in the foreign exchange market. The selling mechanism is based on a transparent procedure designed to prevent additional uncertainty in the financial markets and to minimise discretionary actions by the financial authorities. The amount auctioned in any given quarter is determined on the basis of reserves accumulated during the previous period, net of the foreign exchange sales. The mechanism is activated only when there is a net measured accumulation of international reserves of at least US\$ 250 million. Regarding the effectiveness of the sales mechanism, a significant easing of the pace of international reserve accumulation has been observed and there has been no evident impact of the daily auctions on the functioning of the foreign exchange market. Nevertheless, the mechanism caused some uncertainty among market participants, because of the difficulties in estimating precisely the amount of US\$ that Banco de México would sell in the near future. For this reason, as of May 2004, the authorities decided to smooth out the amount of foreign exchange to be auctioned by averaging the net accumulation over a four-quarter period. The adjustment has been effective in view of the daily amount sold, which has been constant at US\$ 22 million during the last three selling periods (Graph 4). Moreover, it should be noticed that the stock of international reserves has remained relatively stable throughout 2004.

Graph 4
Net international reserves and daily sales through the new mechanism, 2002-04
 Billions of US dollars



Source: Banco de México.

4. The foreign exchange market and economic performance

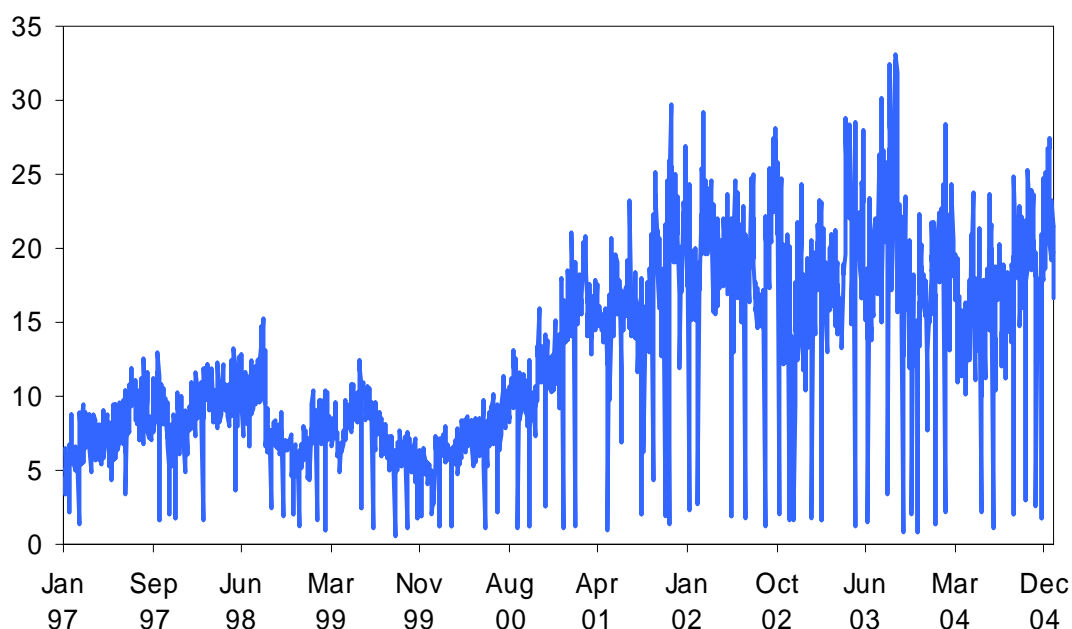
4.1 The development of the foreign exchange market

The institutional reforms and policies undertaken since 1995 - including intervention by the monetary authorities - have all worked mostly as intended, fostering the development of the Mexican peso exchange market. Several indicators point in this direction. First, the volume of operations in the domestic market has more than doubled during 2002-04 compared to 1997-99 (Graph 5). A similar picture emerges from the triennial central bank survey of foreign exchange market activity undertaken by the BIS. The latest issue shows that the daily average market turnover in Mexico was US\$ 15 billion April 2004 in contrast to US\$ 9 billion in 1998. Mexico's market share of the global turnover moved from 0.5% to 0.6% in the period. Moreover, the turnover in the Mexican foreign exchange market, according to the same BIS survey, is now similar in volume to that in Austria, Luxembourg, Norway and Spain.

Graph 5

Volume of the domestic foreign exchange market, 1997-2004

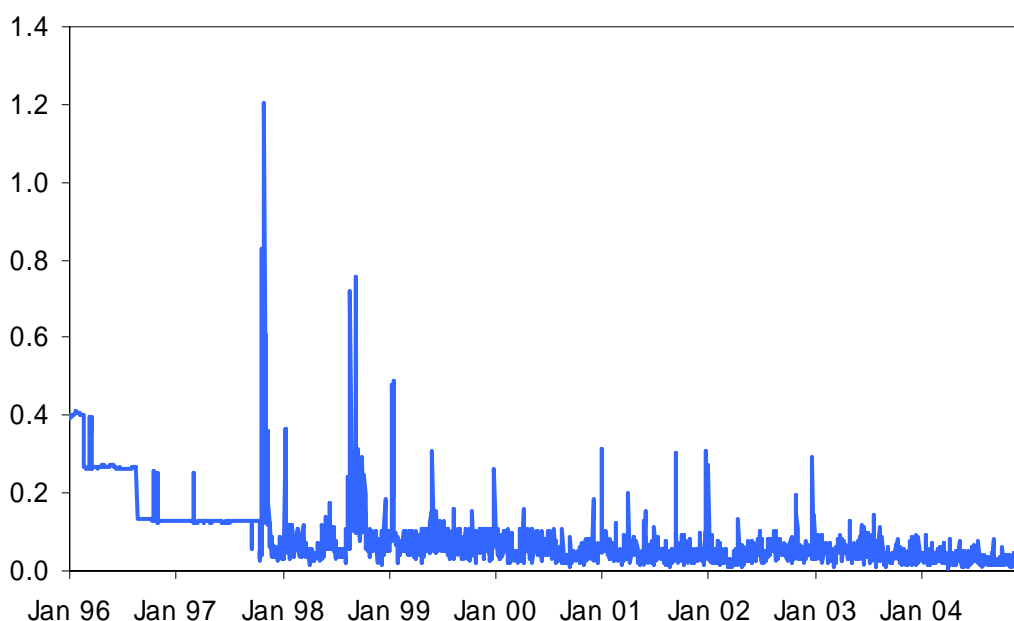
Billions of US dollars



Source: Banco de México.

Another symptom of the maturity of the domestic foreign exchange market is the improvement of its depth and liquidity. Graph 6 shows the dramatic narrowing of the bid-ask spread of the Mexican peso vis-à-vis the US\$ since 1999. Before 1998 it was not unusual to see spreads of the order of 0.5%, but they have not been observed since. In fact, the average spread was 0.05% during 2001-04 (with a very low variance around it) compared to an average of 0.2% during 1995-2000. These spreads are not very different from those associated to major currencies, such as the US\$/yen. This feature is remarkable since, as mentioned before, during this period there were some episodes of financial volatility that did not bring forth a dramatic reduction of market liquidity, as proxied by the spreads.

Graph 6
Bid-ask spread for the Mexican peso/US dollar rate, 1996-2004
 In percent



Source: Banco de México.

The liberalisation measures described in the previous sections also allowed for movements towards completing markets by fostering the development of the hedging instruments needed to properly manage risk. The importance of these instruments is evidenced by the growth of the volume of peso futures in the Chicago Mercantile Exchange (Graph 7). This contract became one of the fastest growing currency products ever traded at the CME and by May 1995 the average daily volume in peso futures topped 3,200 contracts.⁷ During 2004, the average volume traded is more than 12 million contracts a day.

A similar picture emerges from the expansion of the open interest on Mexican peso futures in the same Exchange, as well as in the domestic derivatives market, the Mexder. As a result, the open interest in the Mexican peso in the CME has reached levels similar to those for other currencies. As of 19 October 2004, open interest in the Mexican peso reached 69,840 contracts, compared to 49,694 for the Swiss franc or 66,763 contracts for the British pound sterling.

Another sign of the maturity of the foreign exchange market is the development of speculative positions on the Mexican peso. Graph 8 shows the evolution of non-commercial trades - usually speculative - in the International Money Market (IMM) of the CME. It is quite remarkable to observe how these positions have experienced large swings since 2002, moving from being short to being long on the peso in a rather brief period, a feature that is also present in the most widely traded currencies. Obviously, participation of a diverse set of traders (from funds based on fundamentals to the so-called Commodity Trading Advisors or CTAs) is one of the reasons for the improvement of the liquidity of the foreign exchange market.

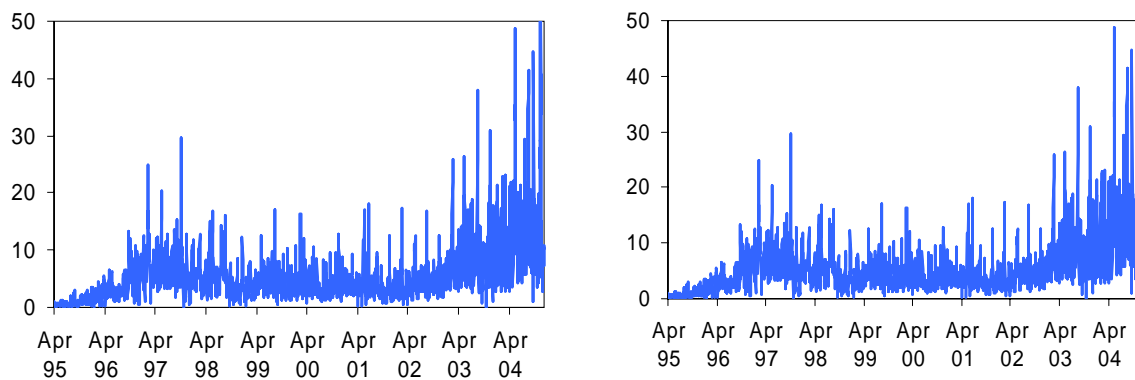
⁷ The size of the Mexican peso futures contract is 0.5 millions of Mexican pesos.

Graph 7

Mexican peso futures market in the Chicago mercantile exchange, 1995-2004

Volume of operations
Thousands of contracts

Open interest
Thousands of outstanding contracts

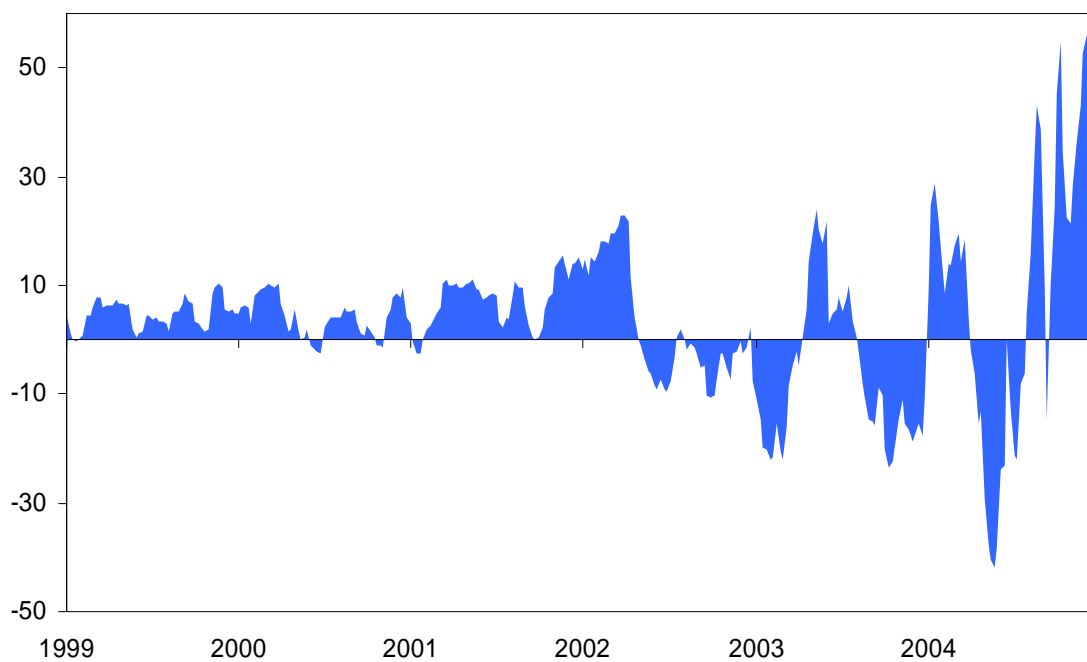


Source: Commodity Futures Trading Commission.

Graph 8

Non-commercial net positions in Mexican pesos in the international money market, CME, 1999-2004

Thousands of contracts



Source: Bloomberg.

In sum, institutional changes oriented to strengthening the foreign exchange market, together with sound macroeconomic policies and other structural reforms, seem to have created a virtuous circle. Once the market starts to grow, the reforms improve the liquidity and depth of the market, which in turn attracts more participants and encourages the birth of new instruments, thereby fostering a further development of the market.

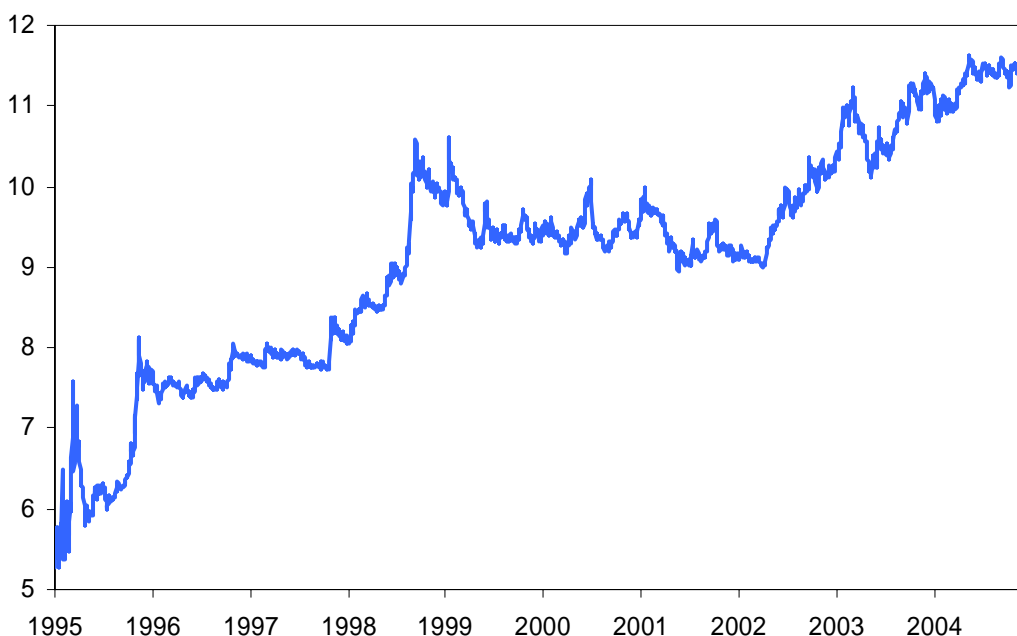
4.2 Economic performance under the floating exchange rate regime

The flexible exchange rate regime has worked well for Mexico. Perhaps one of the benefits of the system is that it has allowed a rather swift adjustment of relative prices without accumulating imbalances that could otherwise become a full-blown balance-of-payments crisis. Moreover, over the course of the decade the floating rate has been consistent with the adoption of an inflation targeting framework for the conduct of monetary policy. In this section we review some indicators of economic performance under the floating regime.

Graph 9 shows the evolution of the Mexican peso/US dollar parity. The exchange rate has followed three paths since it started to float: a sharp depreciation and volatility in the aftermath of the Mexican crises, from December 1994 to January 1999; a mild appreciation and stability up to April 2002; and a steady depreciation from there on (coinciding with the general movement of the US\$ vis-à-vis other major currencies).

This changing behaviour of the exchange rate has meant a radically different environment for economic agents in Mexico. Whereas under the previous pegged exchange rate the only adjustments to the parity were major devaluations, nowadays the Mexican peso can move up or down on any given day. As it is well known, the exchange risk inherent to a flexible regime reduces the odds for one-side bets of the kind that Mexico experienced in the past.

Graph 9
Exchange rate, 1995-2004
Mexican pesos/US dollar

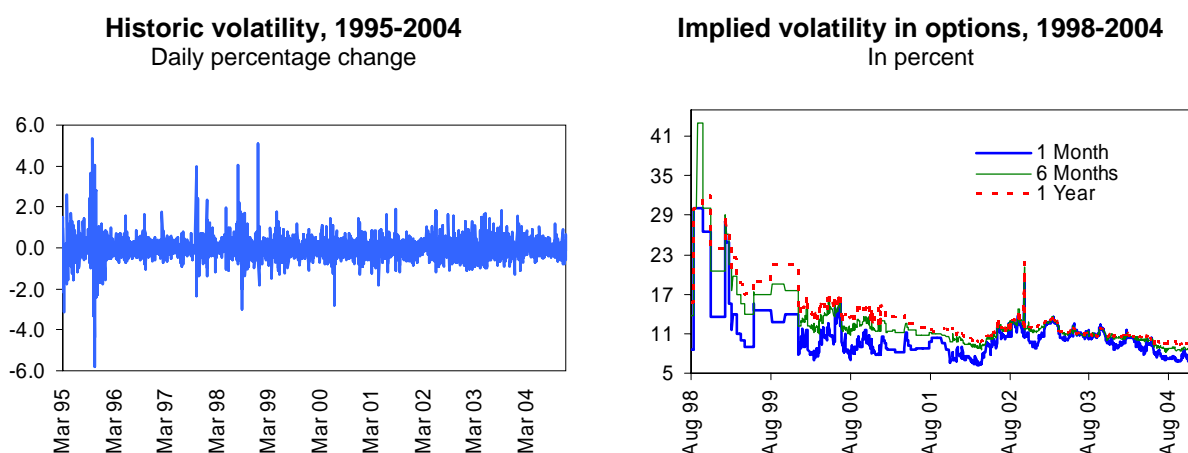


Source: Banco de México

The improved liquidity and depth of the foreign exchange market, together with better macroeconomic fundamentals after the Mexican crises, has led to a more stable exchange rate for the peso (Graph 10). The latter is true both in terms of the actual fluctuations of the peso/US\$ parity and of the implied volatility embedded in options on the rate. The reduction in volatility is quite remarkable given that: (1) during the reported period some important episodes of financial turbulence took place; and (2) the large swings in speculative positions that have occurred in the IMM of the CME (Graph 8).

Graph 10

Volatility of the Mexican peso/US dollar rate



Sources: Banco de México; Bloomberg.

Table 2 provides further evidence of the lessened volatility of the exchange rate of the Mexican peso and a comparison with the fluctuations observed in other currencies. The mean absolute daily percentage change (MADPC) of the Mexican peso was 0.61% in 1995-97. Thus, in the aftermath of the Mexican crises, the peso was the most volatile currency under this metric in our sample of countries. Volatility went down drastically thereafter and the MADPC has been merely 0.38% for the peso during 2001-04. The latter figure is the second lowest in the sample in the Table 2. Only the Canadian dollar posts a smaller MADPC than the Mexican peso, which in turn is less volatile than the British pound sterling, the Japanese yen, the Swiss franc and other, emerging market, currencies.

Perhaps a more interesting issue is whether or not foreign exchange market interventions by Banco de México in fact perturbed the market. We will take a cursory look at three instances of intervention: (1) the put options and the auctions of US\$ of 1996-2001; (2) the discretionary interventions to support the Mexican peso of 1995 and 1998; and (3) the more recent sales of US\$ intended to slow down the pace of international reserve accumulation. Although a more rigorous analysis is called for, the evidence suggests that foreign exchange intervention does not appear to have interfered with the “normal” or “desired” features of the foreign exchange market.

Graph 11 shows a measure of volatility of the peso/US\$ exchange rate (the daily percentage change) and the actual amounts involved in foreign exchange intervention in the market during 1996-2001. As mentioned before, during this period there was some degree of symmetry in the intervention, the put options and the sales of dollars being operations in the opposite direction. The chart shows that neither the exercise of the put options nor the sales of US\$ seem to have influenced the volatility of the exchange rate in any systemic way. However, it is important to recall that the US\$ sales auctions were triggered when the exchange rate depreciated more than 2% in a single day. Hence, it is not surprising that they took place precisely during periods of currency volatility.

Table 2

Exchange rate volatility: different currencies against the US dollar, 1995-2004

Mean absolute daily percentage change

Currency	Average 1995-97	Average 1998-2000	Average 2001-04
South African rand (ZAR)	0.265%	0.513%	0.862%
Brazilian real (BRL)	0.103%	0.444%	0.788%
New Zealand dollar (NZD)	0.320%	0.603%	0.569%
Australian dollar (AUD)	0.373%	0.556%	0.546%
Swiss franc (CHF)	0.519%	0.513%	0.535%
Euro (EUR)	na	0.529% ¹	0.500%
Japanese yen (JPY)	0.512%	0.625%	0.455%
Chilean peso (CLP)	0.213%	0.276%	0.447%
British sterling (GBP)	0.352%	0.378%	0.398%
Mexican peso (MXN)	0.605%	0.381%	0.370%
Canadian dollar (CAD)	0.205%	0.270%	0.358%

¹ Average 1999-2000

Source: Author's calculations based on data from Bloomberg.

Turning now to the episodes of direct intervention on the foreign exchange market, Graph 12 shows the behaviour of the exchange rate during 1995, as well as the amounts of US\$ sold each day during this episode. Given its purpose of subduing speculation, the success of the intervention can be evidenced by the relatively stable path followed by the exchange rate immediately after the event. Furthermore, exchange rate stability together with higher interest rate levels were consistent with the policy intent of ensuring more restrictive monetary conditions.

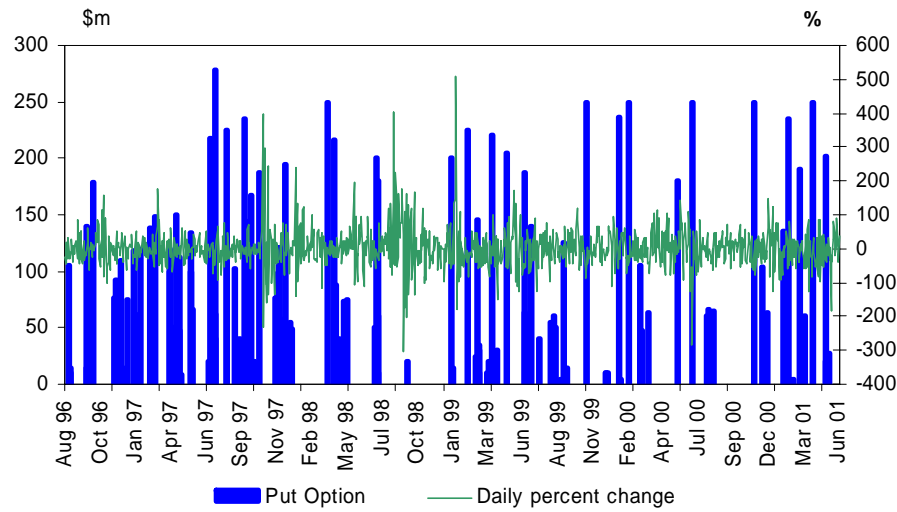
Regarding the last episode of discretionary foreign market intervention undertaken on 10 September 1998 by Banco de México, Graph 13 shows the evolution of the exchange rate the day before and the day after (9 to 11 September 1998). At the time, financial markets were reeling from the Russian crises and the collapse of LTCM. The Mexican peso was under heavy speculation as market participants were trying to (imperfectly) hedge positions in the Brazilian real with pesos. Moreover, as shown in Graph 11, even though several automatic sales of US\$ had already been triggered, speculation went on. To the extent that the intervention interrupted an intraday depreciating trend on 10 September, it can be claimed as a success.

The final piece of evidence regarding the impact of intervention on the performance of the foreign exchange markets concerns the mechanism put in place to slow down the pace of international reserve accumulation. In this regard, it has been observed that the average price obtained in the sales auction remained relatively close to the Fix exchange rate, especially since the smoothing adopted in May 2004 (Graph 14). Moreover, the right-hand panel of Graph 14 shows the daily average bid-ask spread at different times of the day for two different periods: March-May and August-October 2004. The spreads are those quoted around 9:30 am, the time that the US\$ electronic auction took place. Visual inspection suggests that the current sales of US\$ do not seem to have altered intraday volatility in the foreign exchange market in any significant way.

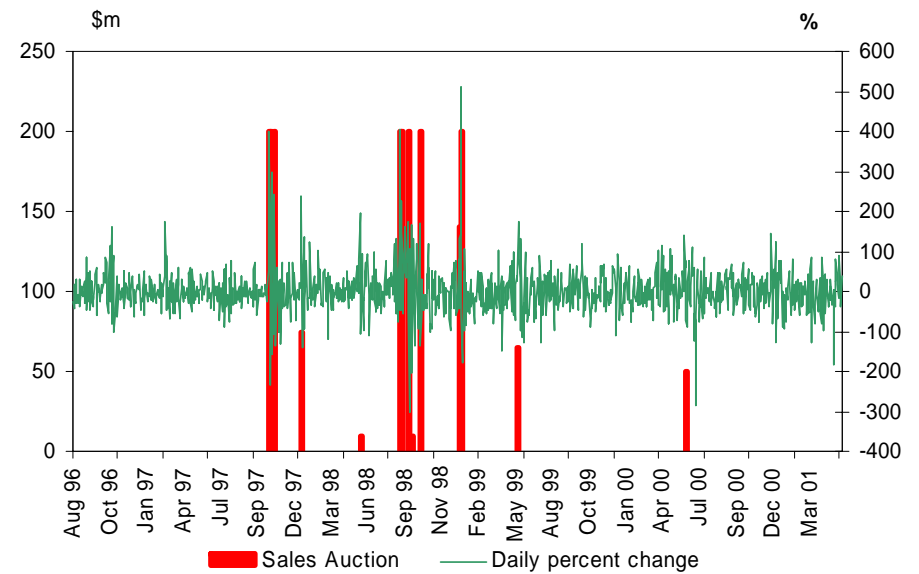
Graph 11

Volatility of the exchange rate and foreign exchange market intervention, 1996-2001

Historic volatility and put options exercised
In millions of US dollars and percentage



Historic volatility and sales of US dollars
In millions of US dollars and percentage

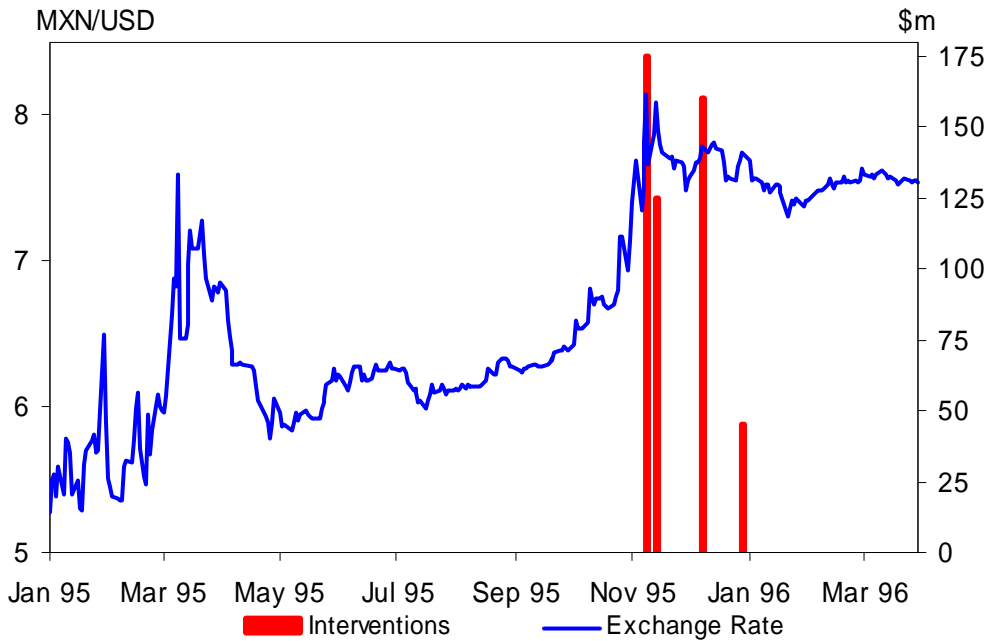


Source: Banco de México.

Graph 12

Banco de México's discrete interventions and exchange rate behaviour, 1995-96

Daily flows in millions of US dollars and Mexican pesos per US dollar

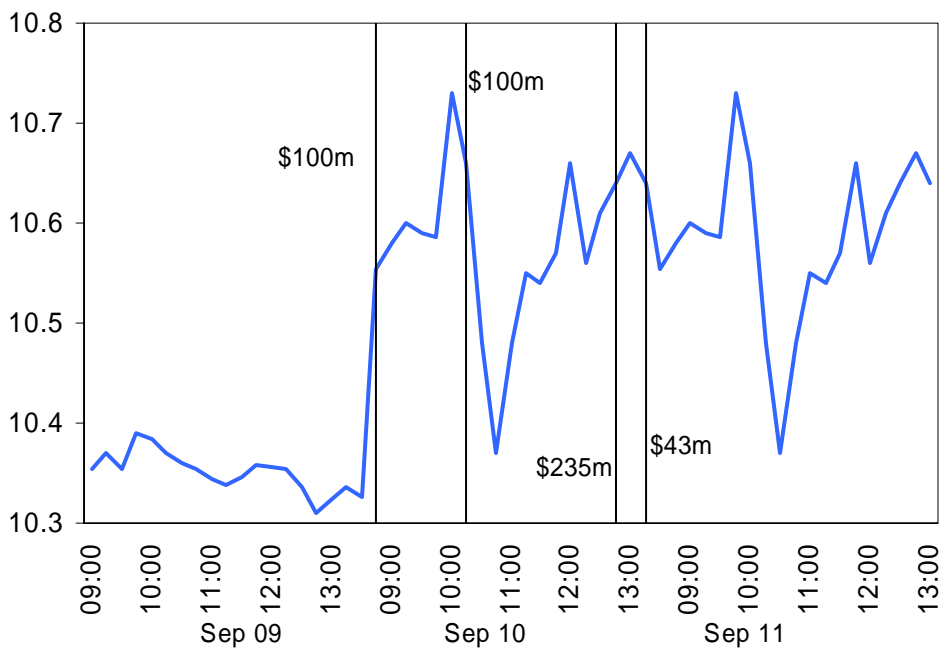


Source: Banco de México.

Graph 13

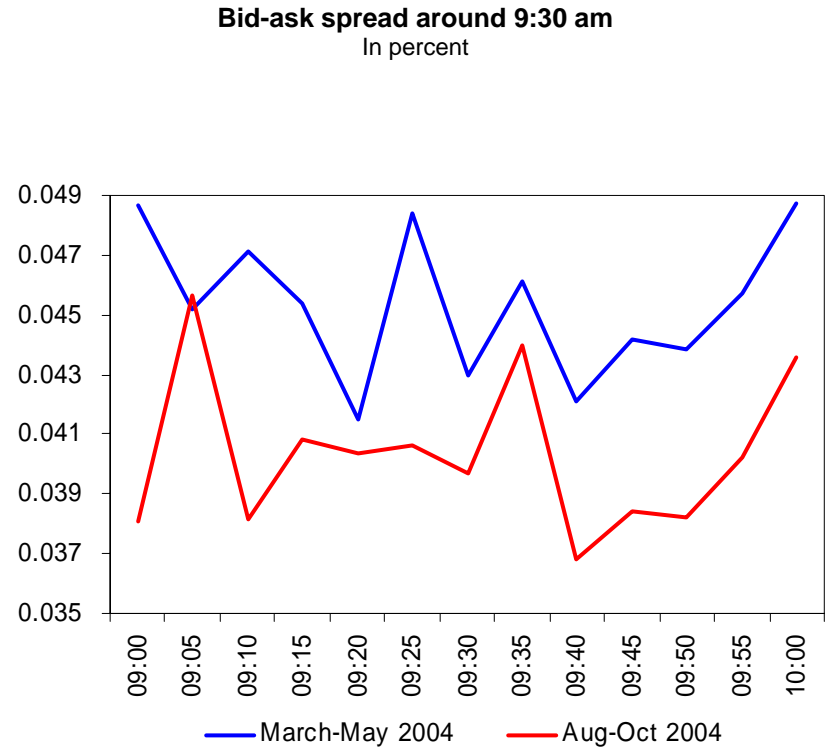
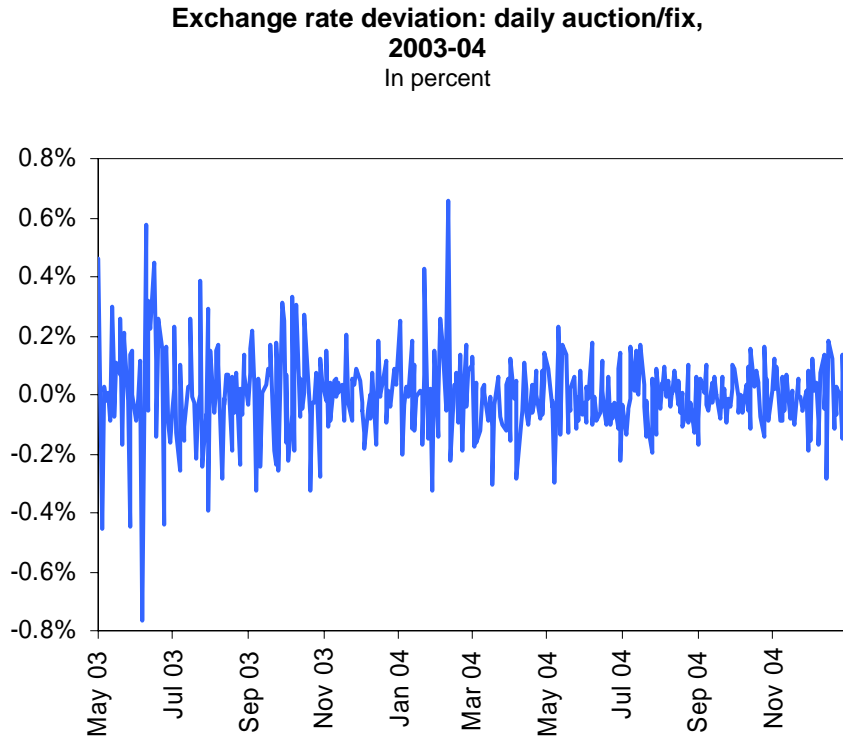
Exchange rate and market intervention, 10 September 1998

Mexican pesos/US dollar



Source: Banco de México.

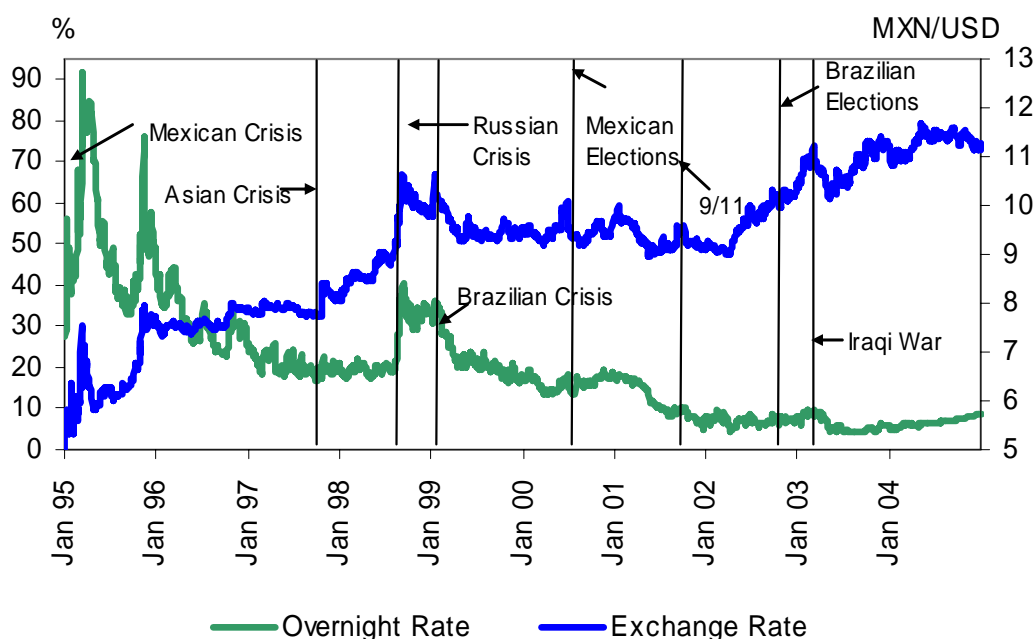
Graph 14
Impact of auctions of US dollars



Source: Banco de México and Bloomberg.

Finally, it is appropriate to conclude the discussion of performance under a floating exchange rate regime with two important considerations. First, the float has been a useful vehicle to let asset prices adjust as needed in the face of exogenous disturbances. The exchange rate regime, coupled with the flexible short-term interest rates embedded in the operating instrument of monetary policy, has allowed the economy to accommodate numerous shocks: the Mexican, Asian, Russian and Brazilian crises, Presidential elections in Mexico and Brazil, 11 September 2001, the Iraqi war, etc (Graph 15). All of these events, to a different extent, have brought forth uncertainty and thus have affected volatility in financial markets. Moreover, under the current set-up in Mexico market forces determine the size of the adjustment and its proper distribution between the exchange rate and interest rates.

Graph 15
Overnight interest rate and exchange rate, 1995-2004
 In percent and Mexican peso/US dollar

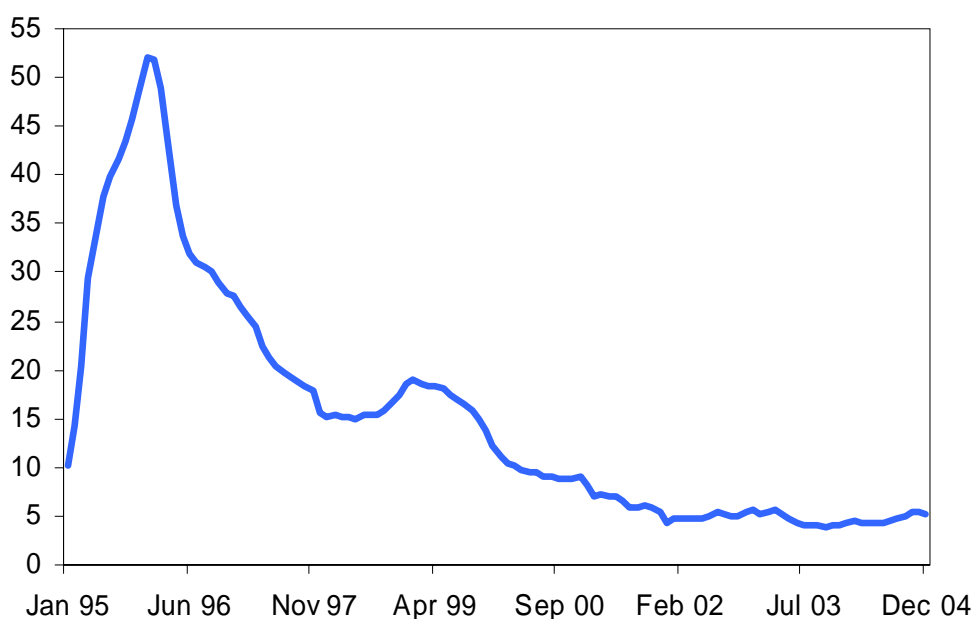


Source: Banco de México.

Second, and perhaps more important, the adoption of a flexible exchange rate has not prevented the authorities from achieving a significant disinflation during the last decade (Graph 16). One of the main fears surrounding the adoption of the floating regime was the possibility that the nominal anchor of the Mexican economy would be lost. In the event, monetary policy has been able to guide inflation expectations through the adoption of an inflation targeting scheme, a strategy that appears to be a suitable complement to the flexible exchange rate.

As a corollary to the latter issue, an important feature under the floating regime has been the considerable reduction in the pass-through from the exchange rate to the consumer price index. The fear that the stabilisation of prices would be nearly impossible in the context of a depreciation, given the sensitivity of prices to the exchange rate, has not been borne by the facts. Economic agents have come to realise that not all exchange rate movements are permanent and have subsequently not passed on all increases into prices. Thus, despite the exchange rate depreciation observed since 1995, and particularly since April 2002, inflation has been dramatically reduced.

Graph 16
Annual CPI inflation, 1995-2004
In percent



Source: Banco de México

5. Concluding remarks

The overall experience of Mexico with a floating exchange rate regime has been a positive one. During the last decade, the flexibility of the exchange rate has helped to soften the effects on the Mexican economy of numerous shocks arising from the domestic front as well as from the rest of the world. In this regard, the floating regime has been a useful vehicle to let asset prices adjust as needed in the face of exogenous disturbances, without accumulating imbalances that could lead to a balance of payments crisis. Moreover, the fears voiced by some analysts that adopting a flexible exchange rate would impede the accomplishment of the stabilisation efforts sought by the authorities, did not materialise. In contrast, the monetary authorities have achieved an important disinflation in the course of the last ten years. In fact, during this period and thanks to the float, the exchange rate became very useful for monetary policy as an indicator variable of market perceptions and inflationary pressures.

It therefore appears that, notwithstanding the short experience of Mexico with the floating regime, economic agents have learned quickly to live under the float. Contrary to the initial concern that a flexible exchange rate would increase volatility, the fact that the currency can depreciate or appreciate in any given period, and that these movements can be both reversed and/or hedged, has changed the behaviour of firms, workers and investors alike and induced a rather stable environment. In this context, one of the most important achievements of the floating regime has been to decouple to a large extent the pricing of goods and services from the exchange rate, with the resulting significant reduction in the pass-through of depreciation onto inflation.

A vast array of measures have contributed to the positive experience of Mexico with a floating rate. The creation of all the institutional infrastructure for the proper functioning, regulation and supervision of the foreign exchange market; the pursuit of sound macroeconomic policies; the policy of transparency and information disclosure; and the adoption of an inflation targeting framework have all played a part in supporting the floating regime. In particular, the latter framework has been an important factor in anchoring inflation expectations and complementing the floating exchange rate regime, providing impetus towards attaining the Banco de México's mandate of price stability.

Regarding the implementation of foreign exchange policy, Banco de México has adhered to two main principles: (1) not to interfere with the normal functioning of the market and (2) to foster the development of the market through the creation of new instruments and by encouraging the entrance of new participants. This strategy is based on the belief that a foreign exchange market that is able to function properly, that is a deep and liquid market where prices are always provided, is the fundamental underpinning of a floating exchange regime. Against this backdrop, intervention in the foreign exchange market has to be understood from the standpoint of a policy designed to improve the operation of market forces in the determination of the exchange rate. Thus, intervention has relied mostly on rules-based and transparent schemes, aiming to provide a level playing field for all market participants.

Banco de México has accumulated a considerable stock of international reserves. These assets were very useful at the beginning of the floating period to discourage speculation against the currency. Moreover, a large stock of reserves led to a reduction in the perception of country-risk, thereby improving the terms of access to financial markets. Nevertheless, these reserves entail costs, so the financial authorities have always evaluated their accumulation through a cost-benefit analysis. Hence, given that at current levels the marginal cost of additional reserves appears to be rising faster than the marginal benefit, the authorities have decided to reduce the pace of accumulation without specifying a target for the stock of international reserves. Defining with precision an optimal level of reserves is a difficult task, comprising important assumptions not only on the future path of several macroeconomic and financial variables but also about the likelihood of infrequent events that may require using foreign assets. Given this difficulty, it appears that the prudent course of action is to err on the side of caution and to continue accumulating reserves, if at a slower pace of increase.

The institutional reforms and policies undertaken since 1995 - including the intervention policies - have all worked mostly as intended, fostering the development of the Mexican peso exchange market. In sum, institutional changes oriented towards strengthening the foreign exchange market, together with sound macroeconomic policies and other structural reforms, seem to have set off a virtuous circle: development of markets, improved liquidity and depth, creation of new instruments, entry of new participants and further development of the market. In this circle, a strategy of central bank intervention that is as non-discretionary and transparent as possible, plays a central role.

Reference

Sidaoui, J (2005): "Policies for international reserve accumulation under a floating exchange rate regime: the experience of Mexico (1995-2003)", in *Globalisation and monetary policy in emerging markets*, BIS Papers, no 23, May.

The Reserve Bank of New Zealand's new foreign exchange intervention policy

Kelly Eckhold and Chris Hunt

1. Introduction and background

Last year the Reserve Bank concluded a review of its foreign exchange intervention policy. In March 2004, the Government approved a Reserve Bank proposal that gives the Bank the financial capacity to use foreign exchange intervention in order to influence the level of the exchange rate. This new approach allows for intervention at the extremes of the exchange rate cycle, directed at leaning against trends in the exchange rate which the Bank assesses to be unjustified by economic fundamentals.

The new policy is in addition to the Bank's usual foreign exchange (FX) intervention objectives. Since the exchange rate was floated in 1985, the Reserve Bank's policy has been to use intervention only in times of "extreme market disorder". The focus of existing policy is on preserving the functioning of the foreign exchange market in a crisis, rather than preserving any given level of the exchange rate *per se*.¹ This crisis management policy is for those very rare occasions when the foreign exchange market itself breaks down, transactions are unable to be completed, and where as a result the stability of the wider financial and economic system is threatened. Thankfully, in the 20 years since the New Zealand dollar was floated the Reserve Bank has not needed to intervene to forestall such a crisis.

The new policy provides the Bank with another monetary policy tool - in addition to the Official Cash Rate (OCR). The Policy Targets Agreement (PTA) between the Governor and the Minister of Finance requires the Bank to maintain price stability whilst avoiding unnecessary volatility in output, interest rates, and the exchange rate. This new tool is designed to help trim those peaks and troughs of the exchange rate cycle that make the task of achieving price stability while minimising unnecessary volatility difficult. Usually the Bank will use the OCR to implement monetary policy, but sometimes (probably rarely) intervention may assist the Bank to achieve its PTA obligations.

The Bank will implement its new intervention policy independently of the Government, in the same way it sets the OCR. Intervention will only be used at times when it is most likely to be effective and when intervention is consistent with the PTA. The Bank has developed criteria to help judge when it is most appropriate to use intervention. These criteria have been publicly disclosed and agreed with the Minister of Finance, consistent with the Bank's generally transparent approach to the formulation of monetary policy. If intervention occurs, it will be transparently communicated to the public after the fact, allowing stakeholders to hold the Bank accountable for its actions.

Underpinning the new intervention policy are adequate financial resources which ensure the Bank's ability to implement its strategy independently of the Government, while maintaining its credibility with markets and the public.

This paper lays out the framework for the new policy. Section 2 summarises the broad objectives and strategy of the new policy. This is followed in section 3 by a discussion on the criteria the Bank will use to assess the merits of intervention in any given circumstance. In section 4 the implications of the new policy for the Reserve Bank's balance sheet are highlighted. The final section describes how intervention will be implemented, and how the intervention policy will be communicated to markets, the public and the Government.

¹ As part of its ongoing legal commitment to advise the Minister of Finance on exchange rate matters, the Reserve Bank is also increasing the level of reserves it holds for crisis management or "insurance" purposes. For a discussion of the Bank's foreign exchange market crisis management policy, see Gordon (2005).

2. Intervention objectives and strategy

What is FX intervention?

In our terminology, foreign exchange intervention is the purchase or sale by the Reserve Bank of New Zealand dollars in exchange for foreign currencies in the foreign exchange market, with the objective of influencing the level of the exchange rate. This is distinct from merely transacting in the FX market to manage normal foreign exchange requirements as such transactions are done with the aim of minimising any impact on the exchange rate.²

Objectives of the new policy

The new intervention policy is aimed specifically at trimming the peaks and troughs of medium-term fluctuations in the New Zealand dollar (NZD) exchange rate, where there is a misalignment between the exchange rate and the value associated with its “fundamental” macroeconomic determinants.

In terms of macroeconomic fundamentals, the value of the exchange rate over the medium to long run is determined by, among other things, relative inflation and interest rate differentials, the stage in the business cycle in relation to its trading partners, movements in the terms of trade, and productivity differentials.³ These relationships mean that the exchange rate can act as a significant buffer for the economy. When the New Zealand economy is weak, for example, profitability and asset returns tend to be low, reducing demand for New Zealand dollar denominated assets. This, in turn, is likely to lead to a depreciation of the exchange rate, helping to promote a return to stronger activity, while encouraging the efficient allocation of productive resources.

But there may be times when exchange rate fluctuations do not fully reflect fundamentals. Examples might include instances where the short-run value of the exchange rate over- or under-shoots its fundamentally-determined or “fair” value because of non-fundamental factors such as the trend-following behaviour implied by some technical trading rules followed by foreign exchange dealers, or other short-term speculative behaviour.

Non-fundamental drivers may at times push the exchange rate to extreme levels, putting undue pressure on some parts of the economy, such as the export sector, and leading to an inefficient allocation of resources. Firms adversely affected may refrain from investing or expanding their operations in such a climate, some may go out of business altogether, while others beneficially-affected might be induced to make ultimately unsound investments.⁴

Instances where there is a significant misalignment between the exchange rate and its fundamental value are probably few and far between. Further, it can be hard to identify exchange rate misalignments. Consequently, it is likely that we will intervene relatively rarely to influence the level of the exchange rate.

Basic strategy

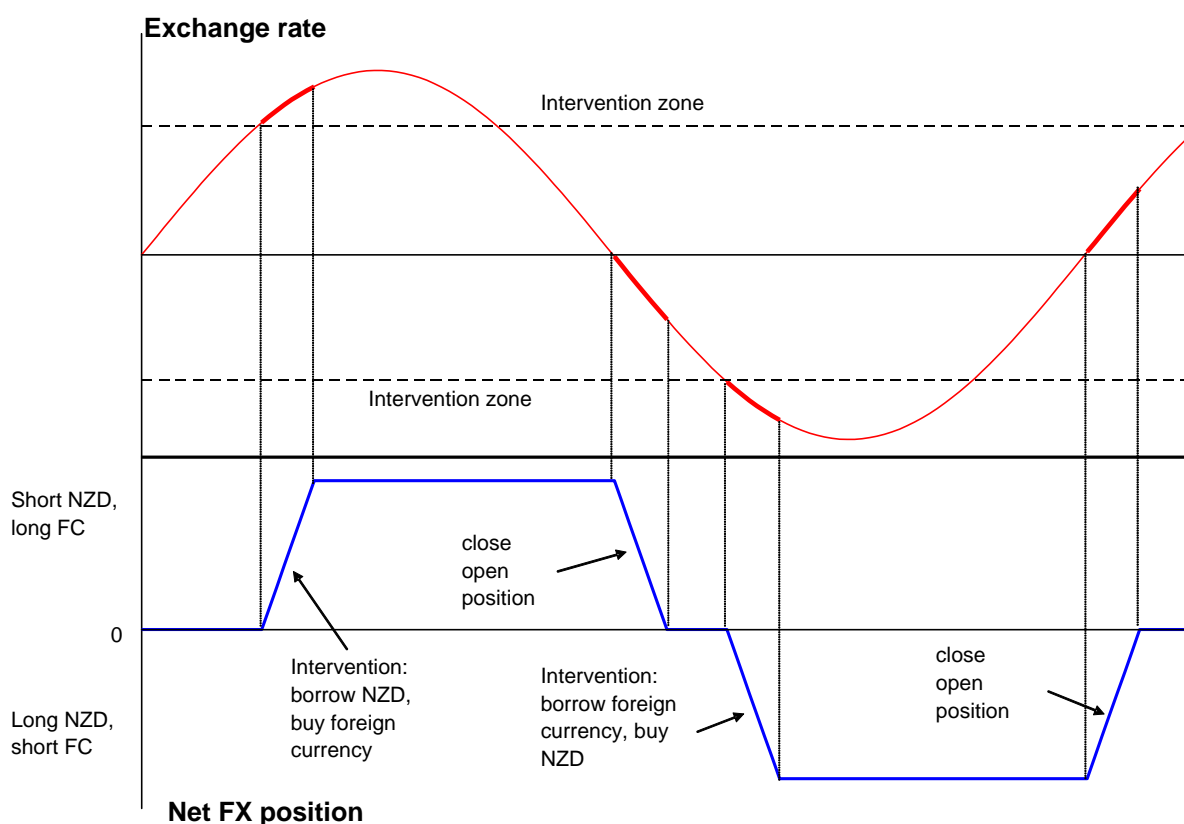
Figure 1 presents a stylised picture of the basic strategy. When the New Zealand dollar is too high (in terms of the benchmark criteria explained in section 3), the Reserve Bank will sell New Zealand dollars and buy foreign currency in the foreign exchange market. Conversely, when the currency is too low, the Reserve Bank will buy New Zealand dollars and sell foreign exchange.

² Some examples of standard FX transactions include those associated with the payment of bills denominated in foreign currencies or transactions to help manage the Bank’s exposure to exchange rate risk.

³ For a discussion of some of these factors, see Munro (2004).

⁴ Such developments raise the possibility of “hysteresis” effects, whereby the growth of firms during low exchange periods is not sufficient to offset declining numbers in high periods. In turn, the overall result could be slower growth of the export or tradables sector than might otherwise be the case.

Figure 1
Illustrative intervention scenario



Intervention near the peaks of the exchange rate cycle will leave the Bank with an open (unhedged) net “long” foreign currency position, while intervention at troughs will result in an open net “short” foreign currency position.⁵ Open foreign currency positions will be closed when the exchange rate nears the middle of the normal cyclical range - that is, when the exchange rate is near its long term equilibrium value. For example, if the Bank had a net long foreign currency position, it would look to buy back New Zealand dollars at that point.

How intervention works

Intervention is thought to work best in situations where it provides a signal to markets about future monetary policy settings or the level of the equilibrium exchange rate. The signal might relate to information the central bank has but market participants do not. The act of intervention may convey a message about monetary policy settings or the exchange rate that gives market participants greater confidence to trade in ways that will encourage the exchange rate to revert towards more justified levels.⁶

⁵ The Reserve Bank’s neutral net foreign exchange position is zero, whereby foreign currency reserve assets held for “insurance” purposes are fully hedged by foreign currency liabilities. Consequently, intervention would involve a net “long” or “short” foreign currency position being established.

⁶ For a discussion of the relevant literature see Sarno and Taylor (2001).

Another reason why intervention might have an impact on the exchange rate in some cases is the idea that exchange rates are partly determined by the underlying structure of the financial markets.⁷ For example, simple technical trading rules that try to take advantage of the continuation of short term trends in financial prices are used widely in the markets.⁸ If exchange rates are at times partially determined by trend-following behaviour not related to macroeconomic fundamentals, then it is possible intervention could have an impact on exchange rates if intervention disrupts the signals that trend followers look for. A relatively modest transaction by the central bank at the right time may be sufficient to slow or even prevent further movements of the exchange rate away from equilibrium. It might also be the case that intervention could encourage short term traders to jump in behind the Bank, reinforcing the efficacy of the initial intervention.

However, all of these mechanisms are subtle drivers of markets. We do not expect that intervention will be effective enough to offset the impact of macroeconomic fundamentals. This view is consistent with the experience of other central banks who have tried to intervene against fundamental trends and have been unsuccessful.

3. Criteria for assessing the appropriateness of intervention

The previous section briefly discussed how the new intervention policy would work, with the goal of trimming the peaks and troughs of extreme medium term movements in the exchange rate.

To successfully implement foreign exchange intervention the Bank has developed a framework and criteria to guide decision making on when to intervene. This will help to ensure that the Bank implements intervention in line with its stated objectives, and that any financial and reputational risks of intervention are managed in a prudent fashion.

Specifically, before intervening the Bank will need to be satisfied that all of the following criteria are met:

- the exchange rate must be exceptionally high or low;
- the exchange rate must be unjustified by economic fundamentals;
- intervention must be consistent with the PTA; and
- conditions in markets must be opportune, allowing intervention a reasonable chance of success.

When is the exchange rate exceptionally high or low?

Since the float of the New Zealand dollar in 1985, the nominal trade weighted index (TWI) has fluctuated in a wide range around a fairly stable long-run average (see Figure 2).⁹

Assessing when the exchange rate is exceptionally high or low is largely a statistical exercise. The current level of the exchange rate would be compared with historical deviations from its long-run average, to identify situations when the deviations are unusually large. This criterion probably involves the least amount of judgement in comparison to the others.

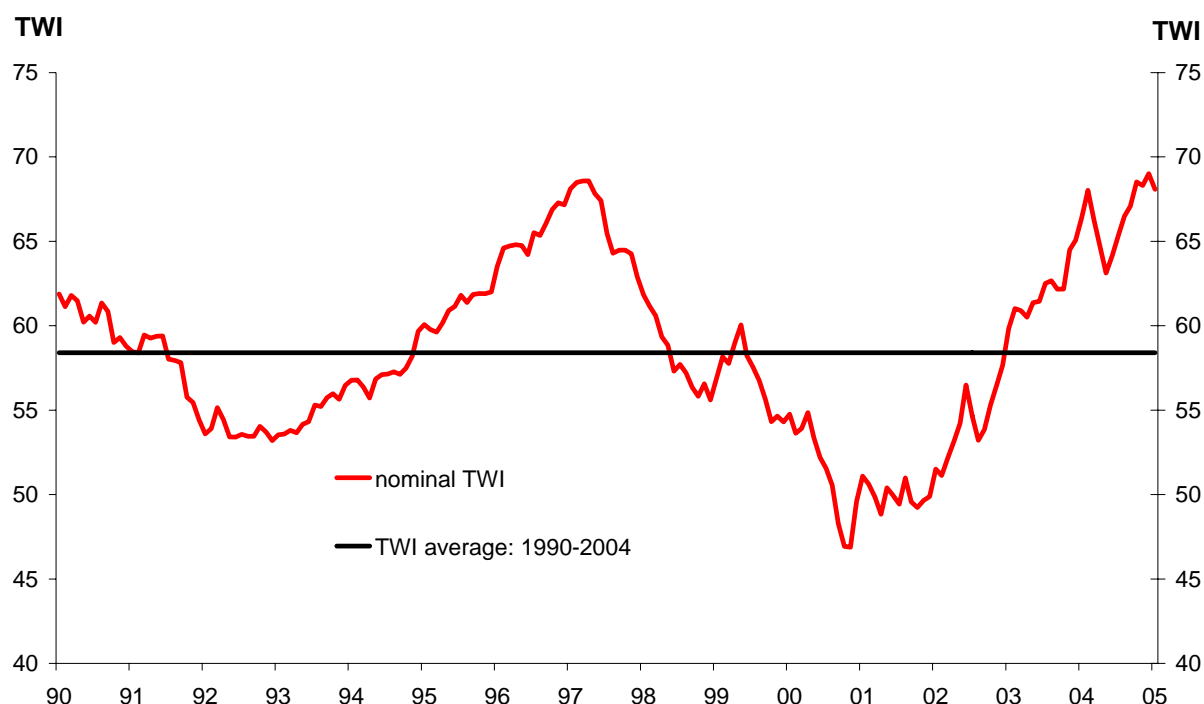
The main focus is on the “effective” exchange rate or TWI, as this best represents a measure of the exchange rate relevant for the whole economy on average. However, individual exchange rates would also be examined as a cross-check to see whether the broad measure is being unduly driven by factors specific to particular currencies.

⁷ Sarno and Taylor (2001) provide a light overview while Evans and Lyons (2002) provide a more in depth examination.

⁸ See Cheung and Chinn (2001) for a survey of the practices of market participants.

⁹ The TWI comprises the currencies of Australia, the Euro zone, Japan, the US and UK, weighted according to each currency's share of New Zealand's merchandise trade and their share of the 5-country aggregate GDP.

Figure 2
Nominal TWI



When is an exchange rate unjustified by fundamentals?

Although the first requirement for intervention might be satisfied - the exchange rate could be *exceptional* by historical standards - it does not automatically follow that the level is unjustified.

In reaching a judgement as to whether the exchange rate might be unjustified, the Bank will look for evidence of a disjuncture between the value of the exchange rate and the cyclical position of the economy and other fundamental factors underpinning medium-term trend movements in the exchange rate.

Any assessment of whether a given exchange rate is *unjustified* requires a judgement of where the currency should be relative to where it actually is, based on particular information on the direction of economic fundamentals. This judgement involves bringing together information from a number of sources. This information set includes, among other things:

The *cyclical* position of the economy relative to trading partners. The exchange rate should depreciate if New Zealand's expected relative growth rate slows. Specific factors include indicators relating to domestic consumption, net migration, the housing market, and relative output gaps. Relative cyclical positions are also often reflected in interest rate differentials, especially given that most TWI partner countries target low inflation. For example, a softer economy implies lower New Zealand interest rates, and hence lower interest rate differentials with trading partners.

The *terms of trade*. An increase in the terms of trade indicates that the real purchasing power of exports has increased, which tends to be associated with a strengthening of the New Zealand dollar.

The *current account position*. The current account is a broad indicator of both external and internal balances which are relevant to the question of whether the exchange rate is justified. For example, an unusually large current account deficit in New Zealand might suggest that the exchange rate is overvalued and that a downward correction in the New Zealand dollar is warranted to bring about external balance.

Other evidence about the general condition of the *tradables sector* of the economy. For example, indicators of significant and unusual levels of activity or profitability within the export sector could provide corroborative evidence that a particular level of the exchange rate was unjustified.

These indicators are not intended to provide a fixed checklist relevant for all situations. An all encompassing set of indicators suitable for deciding whether the exchange rate in every situation is unjustified does not exist. Nor is there an economic model of the exchange rate that reliably integrates all this information into a form that indicates degrees of disjuncture or disequilibrium. The economic relationships alluded to in the foregoing discussion are not fully understood, precisely identified, or static. Nonetheless the focus of intervention policy and this criterion in particular is on significant degrees of disjuncture, in a medium-term context, where the economic relationships remain relevant and precision is much less of an issue. Thus in applying this criterion the Bank cannot and should not take a mechanistic approach to deciding whether intervention is warranted. Each potential intervention will be assessed on a case by case basis using information that seems most appropriate to the situation at hand.

Intervention consistent with the PTA

The third criterion that must be satisfied before intervention is considered is that intervention must not conflict with the PTA. The PTA states that the Bank must aim for inflation outcomes between 1-3% over the medium term, while avoiding unnecessary instability in output, interest rates, and the exchange rate.

At one level, the new intervention policy can help contribute directly to avoiding unnecessary instability in the exchange rate if intervention helps offset a misalignment of the exchange rate from economic fundamentals.

But intervention must not compromise the overriding objective of price stability. In other words, the Reserve Bank will need to be comfortable that any inflationary or disinflationary impact from intervention will not push inflation outside the target range over the medium term.¹⁰ For example, intervention to dampen an upward exchange rate cycle implies less exchange rate restraint on inflation pressures, all else being equal. Hence the Bank will also have to be confident that undesirable future interest rate increases will not be necessary to compensate for a successful foreign exchange intervention.

An implication of the PTA consistency criterion is that intervention should be timed to roughly coincide with the broad thrust of interest rate settings. For example, it makes little sense to intervene to try and push the exchange rate lower when the Bank believes that higher interest rates may be required in the near future to control inflation pressures. In this situation, a successful intervention would inappropriately loosen monetary conditions. Normally, the Bank would look to adjust its main policy lever - the OCR - when overall monetary conditions seem too tight or easy. However, there might be occasions when the Bank is reluctant to move the OCR. For example, the Bank might conclude that further interest rate tightening to offset domestic inflation pressures is inappropriate, but that it is too soon to begin actually cutting interest rates. The Bank could intervene in response to an overvalued exchange rate that is extreme and unjustified, thereby effectively loosening monetary conditions without prematurely beginning an interest rate easing cycle.

Intervention must be opportune

Even if intervention is warranted from a policy standpoint (ie, intervention satisfies the first three criteria), conditions in the foreign exchange markets must be conducive to having a meaningful impact on the exchange rate. It would be pointless, and potentially costly, to intervene in circumstances where there was little chance of affecting prevailing market trends. At the extreme, speculators could be encouraged to trade against the Bank in the foreign exchange market, thereby exaggerating exchange rate mis-alignment.

Intervention is more likely to be opportune and thus effective when most of the following apply:

- there is a relative absence of capital flows that might offset intervention;

¹⁰ A depreciating exchange rate makes imports of consumer goods and inputs more expensive in New Zealand dollar terms and so adds to inflation pressure. Conversely, an appreciating currency constrains inflation pressure by reducing the cost of imports in New Zealand dollar terms.

- market participants are becoming less sure that the exchange rate will remain significantly above or below fair value;
- market participants are becoming less confident that recent trends in the exchange rate that have taken the exchange rate further away from fair value will persist;
- the balance of capital flows is shifting towards pushing the exchange rate back towards equilibrium, and there is some prospect that capital flows in the future will bias the exchange rate to move in a similar direction to that implied by intervention; and
- market participants are positioned in such a way that they are vulnerable to a sudden movement in the exchange rate towards fair value - so that should such a movement occur, they would need to transact to reduce their exposures, with such transactions supporting the direction of intervention.

The Bank is a regular participant in the foreign exchange market and maintains an extensive array of contacts from whom information can be gleaned to assist in making judgements on whether the above considerations are satisfied, and thus whether intervention is opportune.

Taken together, the four criteria provide a robust framework for assessing when to intervene. If the exchange rate is exceptionally and unjustifiably high, and it is opportune to intervene, then it is most likely that intervention will be effective in trimming the peaks and troughs of the exchange rate cycle. It is also more likely that the financial and reputational risks associated with intervention will be minimised as much as possible. Reputational risks are managed because the criteria minimise the chance that intervention will conflict with monetary policy. Financial risks are managed as the criteria reduce the chance of the Bank running down its capital. And both reputational and financial standing are supported by criteria that rule out attempts to defend a particular level of the exchange rate, and that reduce the prospect of intervention against fundamentally determined trends in the exchange rate.

4. Financial implications for the Bank

This section describes the implications that intervention would have on the Reserve Bank's annual net income and on the structure of the balance sheet.

The impact of intervention on the Bank's profitability and capital requirements

Intervention would add significant volatility to the Bank's earnings. This volatility mainly reflects the nature of a floating currency and thus the exchange rate risk inherent in net open foreign positions accumulated through intervention.

Corporations hold capital partly to see them through the times when the company is less profitable than average. The Reserve Bank is no different in this respect. The Bank holds capital in the form of investments in New Zealand government securities that can be liquidated to cover losses incurred while conducting normal business activities.

As intervention implies a higher level of financial risk compared to the Reserve Bank's other activities, the Bank needed additional capital to cover the potential for losses associated with intervention.

The Bank estimated the amount of capital required to be NZ\$ one billion, given the strategy it wished to implement and a conservative view of the peak losses that might stem from the strategy. The Bank's request for a capital injection from the Government, to give it the financial capability to implement intervention independently of the Government, was one of the key recommendations the Bank made to the Minister of Finance early in 2004. The Minister of Finance and Cabinet endorsed the Bank's request for additional capital and that capital was delivered to the Bank in June 2004.

The following two sections describe in more detail the nature of the factors that give rise to the financial risks associated with FX intervention: specifically exchange rate and interest rate risks.

The impact of exchange rate changes

The criteria used to decide when to intervene can mitigate but not entirely eliminate exchange rate risk. Losses from net open intervention positions could accrue for a while. However, these are likely to be temporary or “unrealised” losses, as in the end, unrealised losses will disappear, provided the exchange rate reverts back to its long run average i.e. to at least the level at which the intervention took place.

A more serious situation is one where the Bank might not identify a change in the equilibrium exchange rate and intervenes inappropriately in terms of its criteria. In this case losses could well become “realised”, or appear permanently on the Bank’s balance sheet. However, the appropriate application of the intervention criteria will help minimise the potential for permanent realised exchange rate losses being incurred. This is because the criteria limit intervention to cases of extreme departure of the exchange rate from its long-run average, thereby requiring an extreme change in the long-run average to negate the basic strategy of buying low and selling high. Such a strategy should thus prove profitable in terms of realised exchange rate gains over the medium term for the Bank’s balance sheet.

The impact of interest rates

Intervention results in the Bank investing and borrowing in different currencies at potentially quite different interest rates from normal, making the average carrying cost of holding reserves more variable and perhaps larger.

New Zealand interest rates tend to be higher than those in the countries where the Bank invests reserves (currently the US and Europe). This means that when the Bank intervenes to lean against a high exchange rate - and accordingly when it borrows New Zealand dollars to invest offshore - the average carrying cost of holding reserves would rise.¹¹

At the other end of the exchange rate cycle the opposite would occur. The Bank would earn extra income by borrowing at relatively low foreign interest rates and investing at higher New Zealand rates.

Over the entire exchange rate cycle, the periods when the Bank’s carrying cost of holding reserves is higher than usual should be broadly balanced by periods when the reserves carrying cost is lower. However, it is probably the case that interest rate differentials will be a bit higher on average at the top of the exchange rate cycle than when the exchange rate is relatively low. Hence on average it is quite likely that intervention will add a modest amount to the average carrying cost of holding reserves. These higher average carrying costs should be balanced by the potential for realised gains on the exchange rate described earlier, implying that intervention overall should not prove costly over the medium term, and may prove to be profitable.

The impact of intervention on the level of foreign reserves

Foreign exchange intervention requires the Bank to take on an exchange rate exposure to try to influence the exchange rate. Intervention at the top of the exchange rate cycle will result in an increase in the Bank’s foreign currency reserves, unless the change in exchange rate exposure is achieved by changing the currency denomination of the foreign currency loans the Bank already has (by using derivatives, or by repaying existing loans early and replacing them with New Zealand dollar denominated loans).

Intervention at the bottom of the exchange rate cycle could hypothetically result in the Bank running its foreign reserves down to the point where it had insufficient reserves to adequately deal with market dysfunction in a crisis. In practice this will not occur, as the Minister of Finance has instructed the Bank to ensure that in conducting intervention the Bank maintain a stock of foreign currency investments of

¹¹ Sterilisation of the domestic monetary effect of intervention is automatic in New Zealand, as daily liquidity management operations aim at maintaining a given amount of settlement cash, with standing facilities bounding the overnight interest rate within 25 basis points of the OCR target. The net effect of these arrangements is that the New Zealand dollars borrowed to finance acquisition of US dollars in the intervention are effectively borrowed at market interest rates in the daily open market operations.

at least SDR 2.45b (currently around NZD 5.1b). This means that the Bank will have to borrow in foreign currencies to finance intervention at the bottom of the exchange rate cycle.

Because the Bank's neutral position involves no net foreign currency exposure, intervention at the bottom of the exchange rate cycle thus implies that the Bank's foreign currency denominated liabilities would exceed its assets. Whilst this means that the Bank will have negative net foreign reserves in aggregate, its crisis intervention capacity will not be significantly impaired as it ensures that no more than 20 per cent of its foreign currency loans come due in any year. The foreign currency loans used to finance intervention would also be medium term, leaving the Bank's short-term crisis management capacity intact.

Intervention at the bottom of the exchange rate cycle can also be financed with FX swaps. As long as the swaps are of a medium-term maturity then the Bank's crisis intervention capability will not be substantively affected by intervention.

5. How will intervention be implemented?

Institutional framework

The Bank conducts its crisis management intervention policy in cases of extreme foreign exchange market disorder as an agent of the Minister of Finance. Under section 17 of the Reserve Bank Act, the Minister can instruct the Bank to deal in the foreign exchange markets on the Government's behalf. This means that, while the Bank advises the Minister on crisis intervention, and would implement intervention for crisis management, the actual decision on whether to intervene and the financial implications of that intervention rest with the Minister and the government's account respectively.

The new monetary policy related intervention role is set up differently. Foreign exchange intervention in support of the PTA has been organised to give the Bank full operational independence from the Minister and the Government, in the same way the Bank has independence to formulate and implement monetary policy. This operational independence for FX intervention is provided for in section 16 of the Reserve Bank Act. The implication of this greater independence is that the Governor and the Bank accept the full financial implications of intervention - profits and losses accrue to the Bank and impact on the Bank's balance sheet.

The reason why FX intervention for monetary policy purposes has been set up differently from crisis intervention reflects an effort to manage some of the related risks. In particular, foreign exchange market intervention has the potential to conflict with monetary policy. Because the Bank has control of intervention decisions, it is able to manage conflicts between intervention policy and monetary policy objectives such that the single price stability objective in the Reserve Bank Act is not undermined. In addition, as the Bank has sole responsibility for the timing of intervention and the subsequent squaring out of intervention positions, there is little scope for the Bank to be forced to abandon its strategy early under pressure from the Government. This would help to manage some of the financial risks inherent in intervening at cyclical extremes, as it gives the Bank the ability to hold positions for the time that will generally be required to exit at a profit (once the exchange rate reverts to more average levels).

Transactions

Intervention will usually be conducted in the New Zealand dollar/US dollar currency pair. This is because market participants quote this currency pair the most actively and most other currency pairs are derived with reference to the NZD/USD exchange rate.¹² Using this currency pair allows the Bank to conduct its intervention in the quickest and most efficient manner, maximising the impact on the New Zealand dollar exchange rate against all other currencies.

¹² For example, a market quote in the NZD/JPY would normally be calculated as the product of the NZD/USD and USD/JPY exchange rates - both of which are individually and actively quoted.

The Bank intends to be flexible in its implementation style and will not adopt any fixed method of implementation. However, transactions will generally be with wholesale market participants, and would typically be of a size similar to the standard market parcel (NZD 10 million) or larger. To maximise the strength of the intervention signal the Bank is likely to transact with a number of market makers simultaneously. The Bank will not transact directly with corporates or individual exporters or importers.

The style of intervention is key to the effectiveness of intervention. Normally, market participants (including the Reserve Bank) try to conduct FX transactions in a manner that will minimise the impact of the transaction on the exchange rate. This is usually optimal, as to do otherwise results in higher transaction costs. The execution approach in intervention situations will be quite the opposite, as the aim of the operation would be to maximise the exchange rate impact. This implies that the Bank would look to intervene at times when there is relatively little interest by other market participants to trade against it. Also the style of execution will be relatively aggressive - the Bank will ask market participants to quote it a price and would deal on those prices, thereby forcing transactions into the market. This approach is more likely to result in the Bank's counterparties quickly acting to pass on the Bank's deals to others, creating ongoing transaction activity in the direction the Bank desires, maximising the impact on the exchange rate. The intervention execution approach stands in contrast to the Bank's normal approach of easing transactions into the market with the aim of having no impact on the exchange rate.

Generally, intervention will be quite open and will involve as many market makers as possible, to maximise the signalling impact of intervention. On occasion, though, it may be the case that intervention is covert, involving only one or two market makers, if it seems that this is more likely to lead to a greater chance of success.

The Bank's open foreign exchange position will be closed once the exchange rate returns to near its long-term average value. The associated transactions will be performed in a manner consistent with minimising the impact on the exchange rate. For example, the Bank will pick times when there are a number of other investors interested in trading in the opposite direction, and its execution style will be very passive. Such transactions have quite a different character to intervention, reflecting their quite different objectives.

Communications

The Reserve Bank adopts a very transparent approach to communicating its policies and operations in general. This will also apply to its approach to foreign exchange intervention.

Often, intervention will be very open and public. In these cases the Bank will issue a press release shortly after having intervened, noting it has intervened and the rationale for the intervention. Sometimes, though, the Bank may wish to intervene covertly, which will mean that there will be no comment from the Bank at the time of intervention. The policy regarding commentary is that the Bank will comment on intervention if it thinks such commentary is useful in enhancing the effectiveness of the operation. Otherwise it will not make on-the-record comments to anyone in response to questions regarding intervention.

Regardless of whether intervention is open or covert, intervention will be apparent after the fact. Each month the Bank and the Crown publish data on the status of the Bank's balance sheet and the foreign exchange transactions the Bank has made with the markets. This information will clearly indicate when intervention has occurred within a month or two of its occurrence.

Finally, the Bank's Monetary Policy Statements, testimony to Parliament's Finance and Expenditure Committee, and the Bank's Annual Report will all contain commentary describing the Bank's intervention activities, their rationale, and their impact on the Bank's balance sheet. All of these communication media are important in ensuring that the Bank is accountable for any intervention activities.

6. Summary

This article has provided an elaboration on the Reserve Bank's new foreign exchange intervention policy. The new policy adds another instrument to the monetary policy toolkit, one specifically designed to trim only those peaks and troughs of the exchange rate cycle that are viewed as exceptional and unjustified by economic fundamentals.

The Bank has full operational independence to conduct intervention, but any decision to intervene must be consistent with the Bank's primary objective of price stability laid out in both the Reserve Bank Act and the PTA.

The conditions attached to intervention manage financial and reputational risks the Bank may face when intervening. This prudent approach to intervention is further reinforced by both the NZD one billion of capital reserves added to the Reserve Bank's balance sheet, and the transparency attached to the intervention regime as a whole.

The degree of judgement required to undertake intervention, and the management of risks associated with any actual intervention, present an on-going challenge for the Bank to develop and maintain an appropriate level of operational capability. This capability involves ensuring that the Bank's monitoring and forecasting of economic data is of a high standard, and that there exists a level of technical expertise (and relationship management) to carry out intervention in the foreign exchange market.

As with any other facet of monetary policy, the performance of the Governor of the Reserve Bank in carrying out any intervention decisions would be subject to specific accountability arrangements. These include monitoring by the Bank's Board, the Finance and Expenditure Committee, and the Minister of Finance, together with the general scrutiny provided by market participants and the public at large.

The Bank does not envisage that intervention will be used frequently, as by and large its view is that New Zealand's floating exchange rate does a good job of buffering the economy from external shocks. The new policy gives the Bank the capability to consider intervention in those rare instances when it is appropriate and useful. The new policy will not be a panacea for the large swings in the value of the New Zealand dollar that are a fact of life for a floating exchange rate. At best, intervention offers a mild palliative, and the bulk of exchange rate risk management will continue to sit with firms and individuals within New Zealand.

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Forex interventions in Peru: 2002-2004

Adrián Armas¹

Introduction

Financial dollarisation is a key characteristic to consider when designing and implementing policies in Peru. This is because it has some inherent risks for the economy. For example, an unexpected sharp domestic currency depreciation may have negative consequences on the economy through the well-known balance sheet effect.

In order to reduce financial dollarisation risks, there are some policy responses that can be implemented. One of them is to moderate excessive exchange rate volatility. The Central Bank of Peru (BCR) intervenes in the foreign exchange market to moderate excessive exchange rate volatility, with no target concerning its level. Therefore, these are leaning against the wind interventions.

This paper reviews forex interventions in Peru under inflation targeting (2002-04). The motives for foreign exchange interventions are explained in section 1. The most recent periods of significant forex interventions in Peru are described in section 2. Section 3 outlines the effectiveness of BCR interventions in the foreign exchange market. Finally, some concluding remarks are stated in section 4.

1. Motives

The BCR has an inflation targeting (IT) framework for monetary policy. Consistent with this scheme and with free capital mobility in the economy, the exchange rate needs to be flexible in order for the BCR to be able to implement an independent monetary policy that aims at attaining its inflation target (2.5 percent, with a maximum tolerated deviation of one percentage point above and below the target).

However, policies must take into consideration the high degree of financial dollarisation, both to control its inherent risks and to promote the role of the domestic currency as store of value. Although financial dollarisation has been steadily decreasing in the last few years, the degree is still high. By the end of 2004, 55 percent of broad money and more than 70 percent of credit to the private sector were denominated in foreign currency.

Financial dollarisation causes two types of mismatches in the balance sheet of economic agents (Baliño et al (1999)): maturity and currency mismatches. Regarding the latter mismatch, it causes the private non-financial sector to face an exchange rate risk. This is because its income is basically denominated in domestic currency, while it has debts in foreign currency. Thus, an unexpected large domestic currency depreciation may trigger the alarm on the solvency of the private non-financial sector, thereby increasing the financial sector's credit risk.

The financial sector, on the other hand, has a maturity mismatch that is related to the fact that it has short term liabilities in foreign currency, while its assets in the same currency have a larger average maturity. Although this type of liquidity risk is common to banking systems, the risk in a financially dollarised economy is higher because the central bank does not issue foreign currency.

Certain policies have been implemented to deal with financial dollarisation risks in the Peruvian case (BCR (2003)). They aim at reducing it or at assuring the availability of liquid funds in a contingent financial sector foreign currency liquidity crisis.

¹ The views in this paper are those of the author and do not necessarily represent those of the BCRP. I wish to thank Francisco Grippa for his valuable contribution to this paper.

Table 1

Financial dollarisation indicators

As a percentage of total monetary aggregate

Year	Banking system broad money	Banking system credit to the private sector	Financial system credit to the private sector
1993	69	76	77
1994	64	74	74
1995	63	71	72
1996	67	74	72
1997	65	77	75
1998	69	80	79
1999	70	82	82
2000	70	82	81
2001	67	80	78
2002	65	79	76
2003	62	77	73
2004	55	74	71

One of these measures is to have a high level of international reserves. A high level of international reserves is a buffer stock for supporting the financial system whenever a bank run on a foreign currency-denominated liability occurs. It is also necessary for carrying out eventual forex interventions when there is an unexpected sharp domestic currency depreciation episode.

Table 2

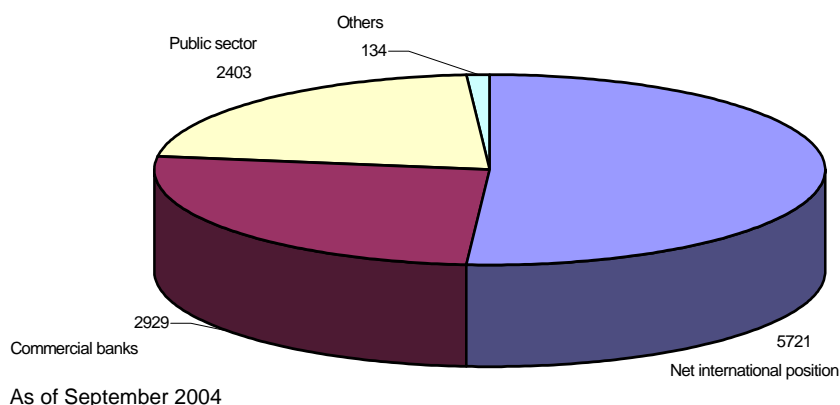
Financial dollarisation risks	Policy responses
Liquidity risk (maturity mismatch)	High level of international reserves
Exchange rate risk (currency mismatch)	High reserve requirements on commercial bank foreign currency liabilities
	Central bank moderates excessive exchange rate volatility
	Inflation targeting framework
	Capital market development in domestic currency

A criticism to keeping a high level of international reserves is the moral hazard that is present in every insurance. Given that there is a high probability that the central bank would use the international reserves to provide liquidity in the "bad state of nature", the financial system may fail to internalise dollarisation risks. In Peru, the financial system has a high reserve requirement on foreign currency liabilities (about 30 percent), which reduces this perverse incentive.

These deposits are part of BCR net international reserves. Approximately half of net foreign exchange reserves are borrowed, in the sense that this part of international reserves corresponds to central bank foreign currency domestic liabilities: 27 percent are commercial banks' foreign currency deposits at the BCR (mainly as part of reserve requirements), while 22 percent are government deposits. This proportion of borrowed reserves has been declining over the last two years, given that the central bank has been purchasing foreign currency in the market in 2003 and 2004 to smooth the appreciating trend of the Peruvian sol.

Net international reserves

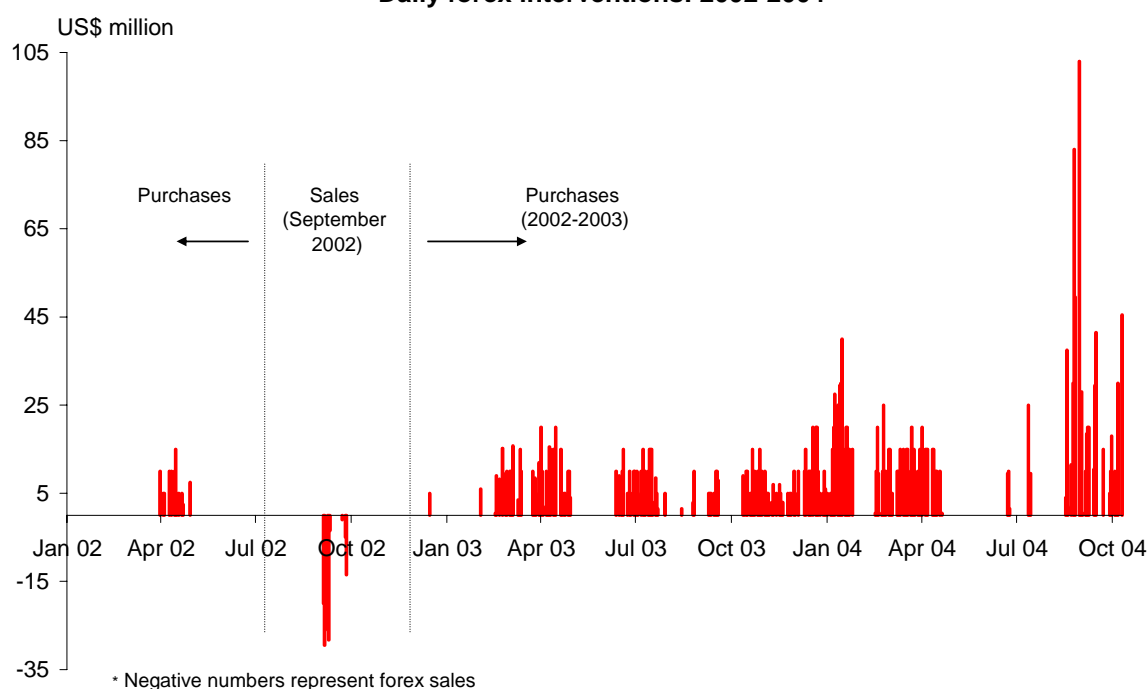
In US\$ million



Other mechanisms to reduce financial dollarisation risks are the implementation of an inflation targeting framework for monetary policy and the development of the local capital market in domestic currency.

Finally, the BCR has the policy of moderating excessive exchange rate volatility. Forex interventions lean against the wind, with no target concerning the exchange rate level. This smoothing goal relates to the rate of change of the exchange rate, as measured in a low frequency. The empirical evidence shows that the BCR does not change the sign of interventions (from buying to selling, or vice versa) from day to day.

Daily forex interventions: 2002-2004



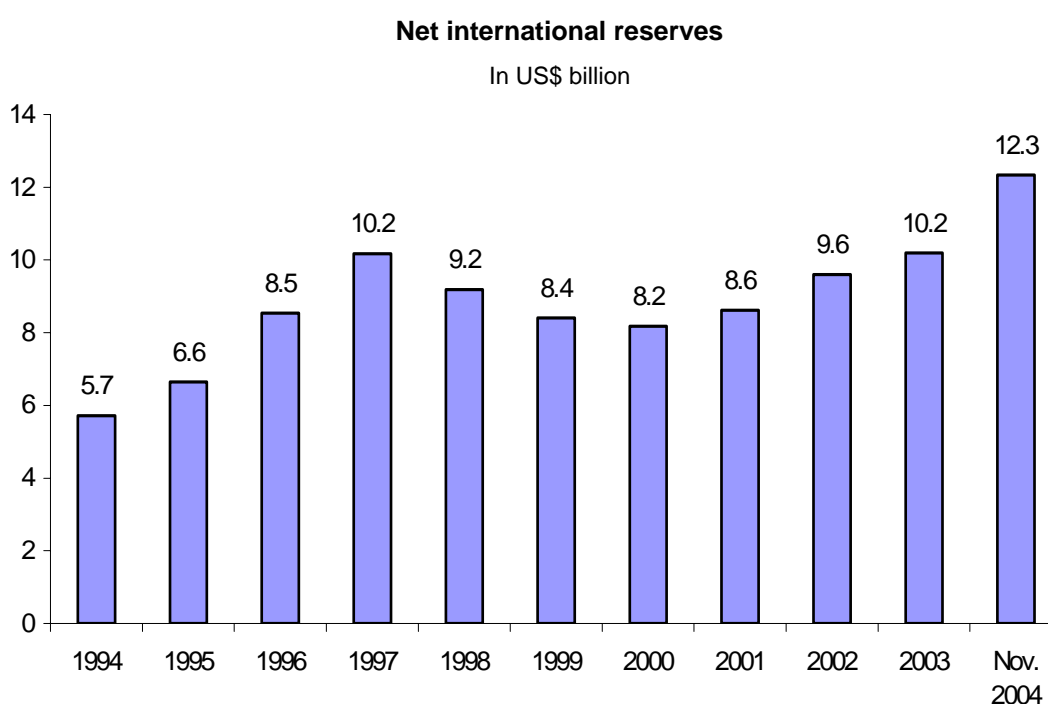
There is no commitment to a fixed or stable exchange rate because that would be inconsistent with the IT framework. Moreover, it would probably lead to a moral hazard problem: economic agents may fail to internalise the inherent currency risk of financial dollarisation if they perceive that the central bank is providing them with an implicit foreign exchange insurance through forex interventions targeting an exchange rate level.

In addition, Ize and Levy-Yeyati (1998) presented a portfolio model of financial intermediation in which currency choice is determined by hedging decisions on both sides of a bank's balance sheet. Dollarisation hysteresis is shown to occur when the expected volatility of the inflation rate is high in relation to that of the real exchange rate.

In this way, although excessive exchange rate movements are risky in a financially dollarised economy (balance sheet effect), it is also convenient to let the exchange rate float because that is an incentive for economic agents to dedollarise. In turn, lower dollarisation reduces the risks of higher exchange rate variability.

BCR foreign currency sales have been useful to show markets that foreign currency would be provided if necessary, especially in an episode of financial turmoil, like the one in September 2002. They counteract any overreaction and smooth the path of the exchange rate.

Foreign currency purchases, on the other hand, have also allowed the increase of net international reserves (NIR) from US\$ 9.6 billion in December 2002 to US\$ 12.3 billion in November 2004.



The high level of international reserves has had some positive impact on credit ratings by reducing the probability of a domestic financial crisis, acting as an “insurance” against the latter. The higher the insurance, the safer the country seems. The importance of this is greater when considering the expected increase in US interest rates, which in the past have caused significant capital outflows in Latin American economies.

This precautionary policy of accumulating international reserves looks forward to a period of increasing interest rates in foreign markets (2004-06) and to the upcoming domestic general elections (first semester of 2006). A high net international reserves balance reduces the risks of increased uncertainty that usually come along with general election periods, particularly in emerging markets.

This NIR accumulation has allowed the improvement of international liquidity indicators, such as the ratio of coverage of short term external liabilities and broad money, in the last two years.

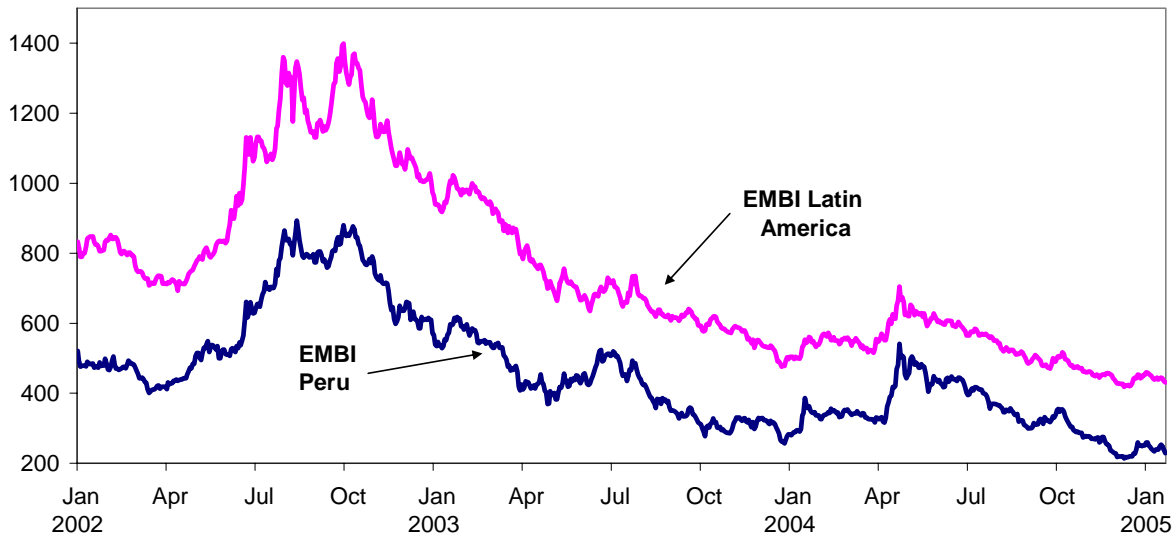
Table 3
International liquidity indicators

	2000	2001	2002	2003	2004
NIR/short term liabilities	1.5 times	1.7 times	2.2 times	2.2 times	2.3 times
NIR/imports of goods and services	13 months	14 months	16 months	15 months	15 months
NIR/banking system broad money	61%	61%	65%	67%	69%

2. Forex interventions in 2002 and 2003-2004

The increased uncertainty over the election process in Brazil and the higher risk aversion of international investors due to default events in the U.S. capital market boosted Peru's country risk during the second and third quarters of 2002, as the following graph shows. This caused a rise in domestic currency depreciation expectations, encouraging the demand for foreign currency hedging assets. The BCR adopted measure to calm the market overreaction and reduce exchange rate volatility.

Sovereign Risk
(January 2002 - February 2005)



The rise in the demand for foreign currency hedging assets showed up in the relatively new forex forward market, developed by commercial banks in the mid 90s. In periods of higher exchange rate volatility, as in 1998-99 (Russian and Brazilian crises), 2002 (uncertainty over political elections in Brazil), and 2004 (significant terms of trade increase), the average outstanding stock of forex forward contracts has been larger.

Table 4

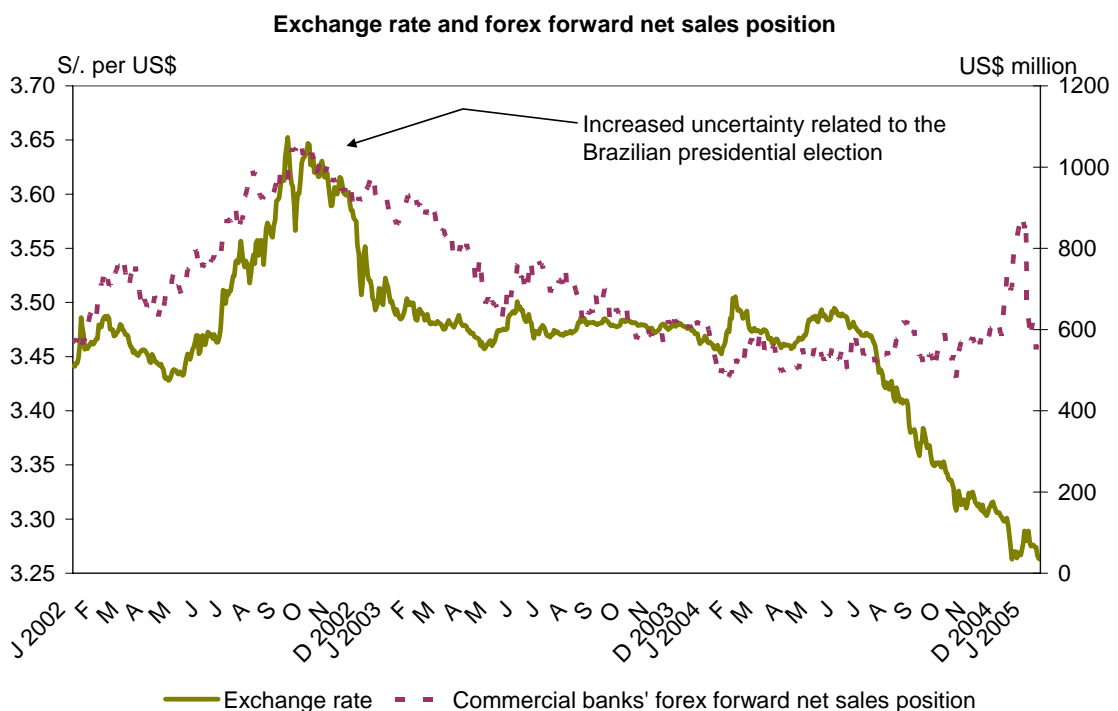
Forex forward market

Average outstanding stocks, in US\$ million

	Purchases	Sales	Purchases + sales	Exchange rate standard deviation (S/cents)
1998	267	779	1047	12.5
1999	149	548	696	7.2
2000	192	648	841	2.8
2001	398	929	1326	4.8
2002	317	1151	1468	6.6
2003	222	937	1159	0.9
2004	449	1014	1463	7.4

Source: BCR.

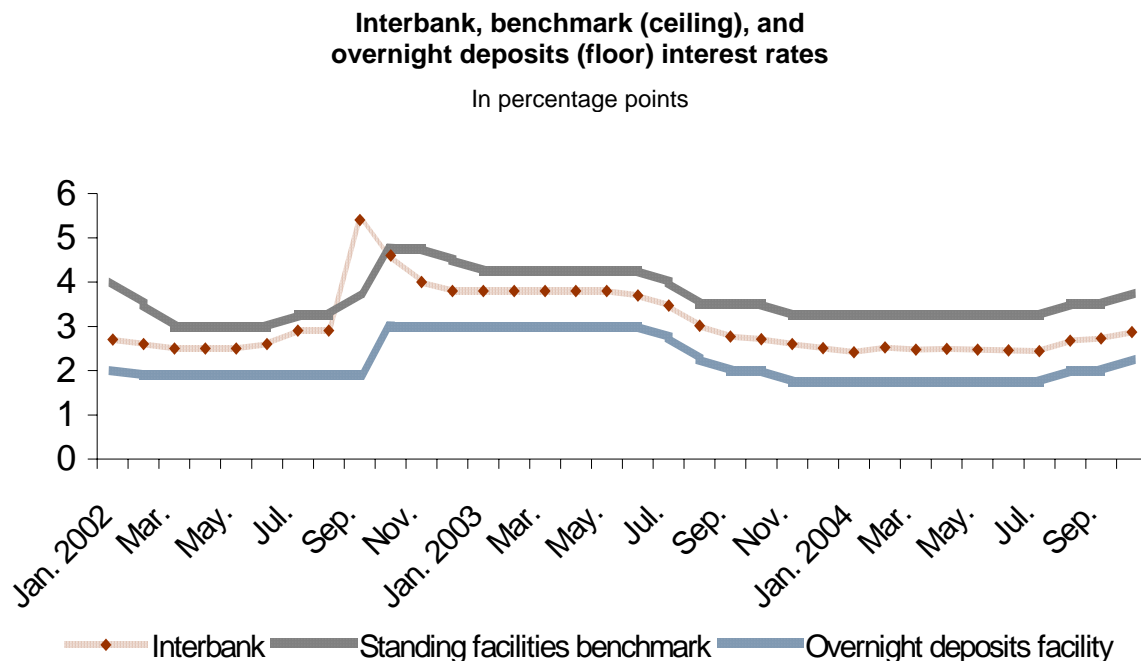
The Peruvian forex forward market is asymmetric. Forward sales of foreign currency are far greater than forward purchases. This may reduce the scope of using this market for hedging purposes in periods where there is a strong pressure for the domestic currency to depreciate. When there is a drastic increase in domestic currency depreciation expectations, commercial banks sell forex forwards and buy foreign currency in the spot market in order to hedge the former operation, which causes the exchange rate to rise. This can be noticed in the following graph: the forex forward net sales position began to increase in the third quarter of 2002, and the exchange rate followed the same pattern; when it decreased in the fourth quarter of the same year, the exchange rate followed shortly after.



Between May and September, Peruvian sol/US\$ exchange rate fluctuations were closely related to those of the Brazilian real/US\$. In this period, the Peruvian domestic currency depreciated 5.8 percent, even though there were no macro fundamental reasons for this to happen.

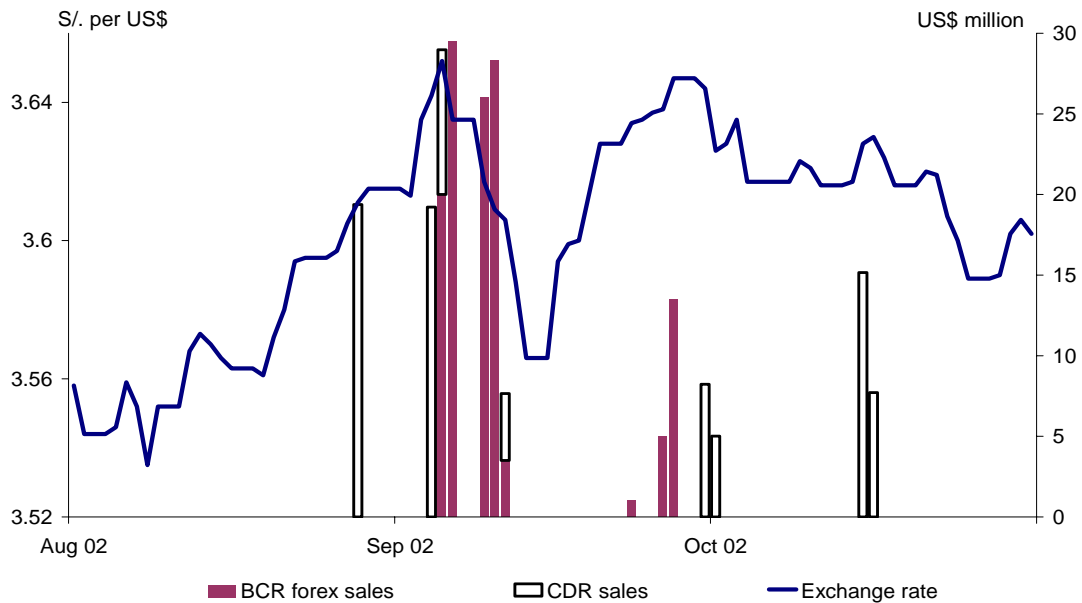
The central bank intervened in the foreign exchange market to counteract the overreaction and smooth the path of the exchange rate. At the same time, the central bank transitorily increased the policy interest rate in order to moderate the sharp exchange rate variability by increasing the cost of domestic currency funds that were being used to buy foreign currency.

The interbank interest rate increased from 2.6 percent in June to 2.9 percent in August, and to 5.4 percent in September.



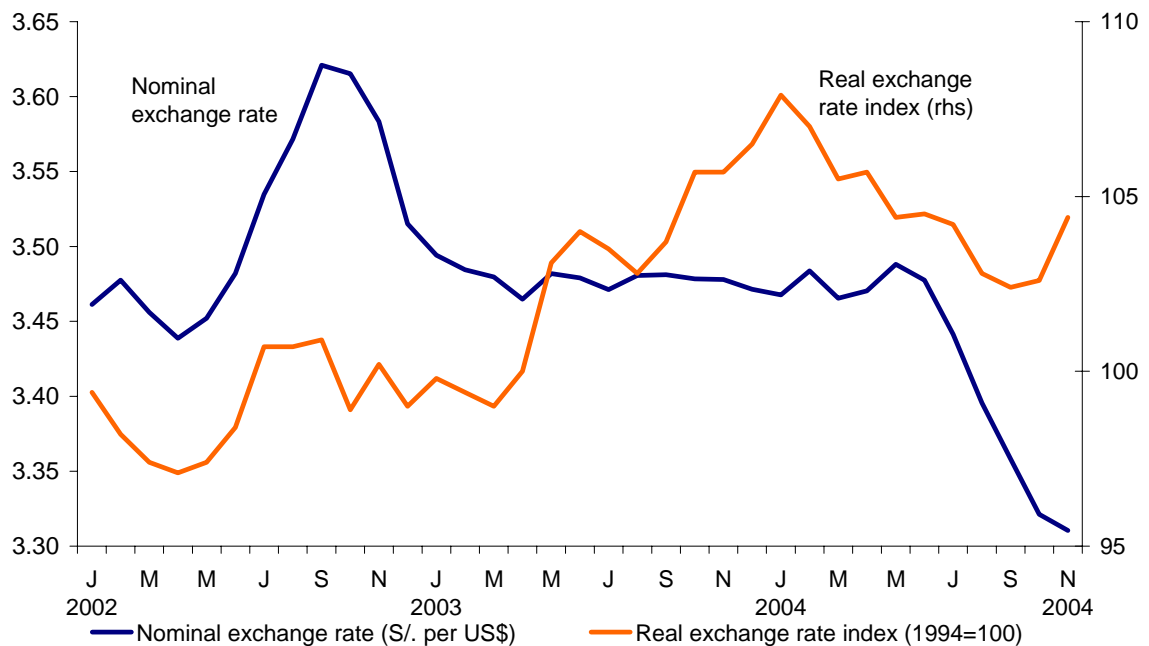
On the other hand, the higher foreign currency assets demand was matched with forex sales that added up to US\$ 127 million during September. In addition, between the end of August and mid-October, the central bank sold approximately US\$ 90 million in CDR. These CDR are securities denominated in domestic currency, but adjusted for foreign currency price movements. Thus, they were aimed at providing the market with a hedging asset and, in this way, lowering the pressure on the exchange rate. This market instrument is also used in Brazil and Chile. The amount of CDR issued between July and October 2002 was relatively low (0.16 percent of 2002 nominal GDP and 0.3 percent of the average daily turnover in the forex market). Since 2003 there have been no CDR in the market.

Exchange rate and BCR forex intervention in 2002



These measures allowed the exchange rate to smooth its upward trend. The Peruvian sol depreciated 1.7 percent against the US dollar in August and 0.8 percent in September. In October, uncertainty over the Brazilian presidential election fell and the Peruvian economy began to be differentiated from the other economies in the region thanks to its better macro fundamentals (GDP growing at rates of more than 4 percent, inflation below 2 percent, and fiscal deficit continuously reducing). These made possible the reduction of depreciation expectations, so that the interbank interest rate declined to 4.6 percent in October, while the exchange rate decreased 1.2 percent in October and 2.6 percent in November. The benchmark standing facilities interest rate was then reduced from 4.75 percent in October and November to 4.5 percent in December.

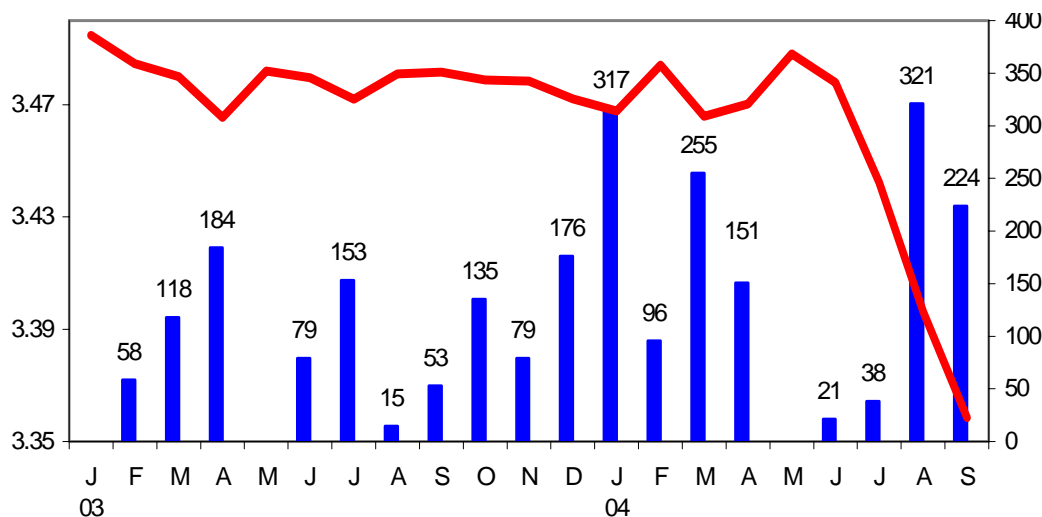
Nominal and multilateral real exchange rate¹



¹ An increase means that the domestic currency depreciates.

Since 2003 there has been a domestic currency appreciation trend. Peru is not alone in this process: all other major currencies in the Latin American region are facing the same process. The reasons are related to the weakness of the US dollar in international markets and to positive results in the Peruvian external sector.

Nominal exchange rate and BCR monthly forex interventions (purchases): 2003-04



During this domestic currency appreciation period, forex interventions have mainly taken place when appreciation pressures on the domestic currency significantly increased due to portfolio movements from foreign to local currency, aiming at smoothing the exchange rate fall.

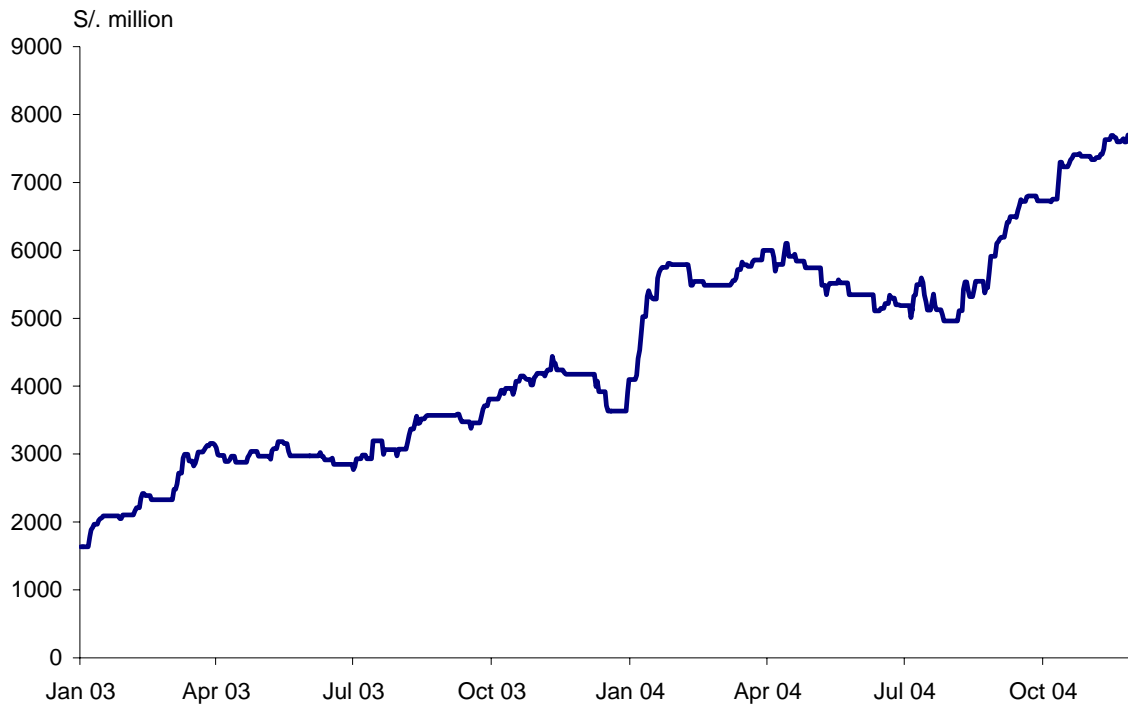
Since the beginning of 2003, the BCR has purchased around US\$ 3.1 billion (as of 30 November 2004) in the foreign exchange market. This has allowed the strengthening of the BCR's international reserves position and made it possible to accommodate portfolio movements in a context of steady financial dedollarisation.

Forex interventions have also allowed the BCR to accumulate US\$ 2.7 billion in net international reserves, relative to December 2002. Thus, the stock of NIR reached a balance of almost US\$ 12.3 billion in November 2004, the highest ever recorded. It is an important buffer stock against any disruption in the economy, considering that, for instance, it is more than twice the stock of the due-in-one-year external debt (debt in foreign currency with non-residents).

These forex interventions have been sterilised. The central bank uses the daily interbank interest rate as operational target for controlling monetary conditions. Banking reserves demand that is consistent with the operational target is satisfied via repo operations or issuing BCR securities (CDBCRP). In this way, daily monetary operations aim at keeping the interbank interest rate at the level set by the central bank (policy target level).

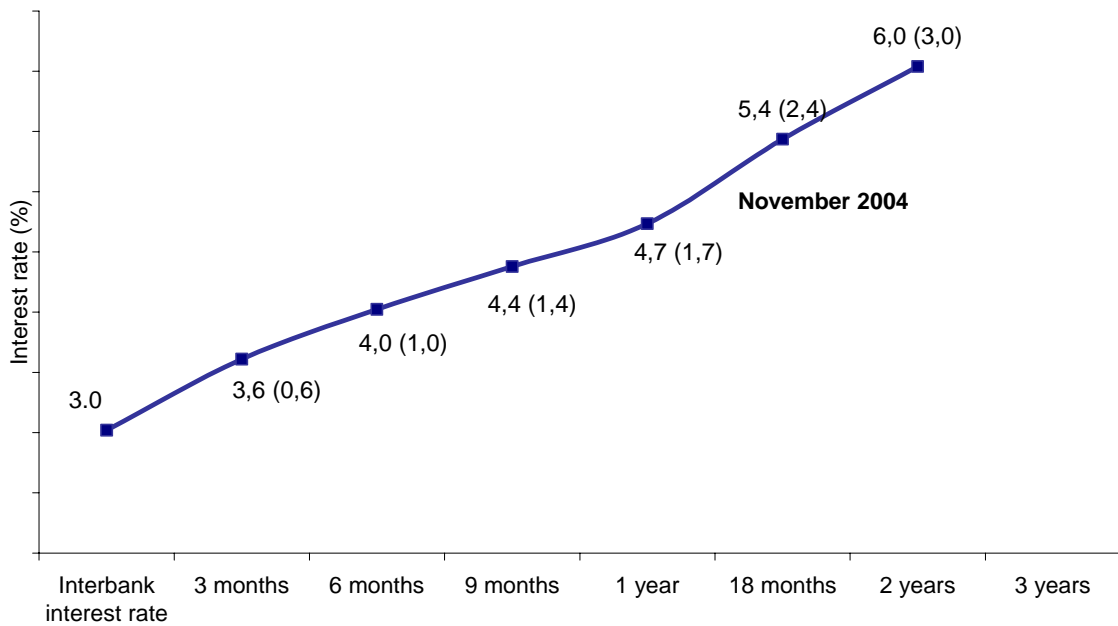
However, forex purchases may imply that supplied banking reserves are greater than reserves demand. This would cause a downward pressure on the interbank interest rate. Therefore, foreign exchange interventions in 2003-04 have had to be sterilised with CDBCRP in order to avoid the deviation of the interbank interest rate from the policy target level. The stock of CDBCRP has increased from S/ 2.0 billion (1.0 percent of 2002 nominal GDP) to S/ 8.3 billion (3.5 percent of 2004 nominal GDP) between the end of 2002 and the end of 2004.

BCR securities stock



These securities are issued with maturities ranging from one week to three years. In November 2004, for example, the average interest rate for 3-months-maturity CDBCRPs issued in that month was 3.6 percent, while that for CDBCRP with a maturity of two years was 6.0 percent.

CDBCRP yield curve¹



¹ Numbers inside brackets are spreads relative to the interbank interest rate.

Maturity

A risk related to sterilised forex purchases is that the interest rate on the securities used to sterilise is higher than that the central bank receives from its foreign exchange investments.

The central bank has the authority to determine the exchange rate regime, to conduct the exchange rate policy, and to decide on interventions in the foreign exchange market. In this sense, any cost due to the intervention is solely of the central bank, with no cost being allocated to the government. However, if the BCR's net worth turns out below legal capital, the Charter Law calls for the Treasury to issue bonds in favour of the central bank.

3. Effectiveness of forex interventions

Although financial dollarisation increases the vulnerability of the economy to depreciation-induced balance sheet problems, it seems to have made forex interventions less difficult. Given this high financial dollarisation, the amount of domestic currency in the economy is smaller than it would otherwise be. Therefore, it is less difficult for the BCR to influence the exchange rate with a relatively small intervention.

The estimates for the average daily turnover in the foreign exchange market decreased from US\$ 297 million in May 2002 to US\$ 261 million in May 2003 and to US\$ 216 million in May 2004. Although forex interventions have been relatively frequent since the beginning of 2003 (the BCR has conducted foreign exchange interventions on approximately 47 percent of business days between January 2003 and September 2004), the average size of foreign exchange interventions has been relatively small (US\$ 7.1 million as of September 2004) relative to the average daily turnover in the forex market.

In addition, it is possible for the BCR to estimate supply or demand pressures on the forex spot market, and thus forex volatility arising from portfolio currency movements can be readily identified. If an intervention is necessary, it is made in the wholesale spot market (operations are done just with commercial banks). The BCR does not intervene in the forex forward or swap markets.

These forex interventions are not pre-announced. However, ex-post, data on forex interventions are available at the end of the day on which the intervention has taken place. These data can be found on the BCR's website (www.bcrp.gob.pe). There is information on the amount of the intervention and on the exchange rate of the forex operation. Moreover, a general statement on reasons behind any eventual FX intervention decision is published in the Inflation Report issue that immediately follows the operation.

Usually, when the BCR intervenes in the forex market, the media put special emphasis on the amount of the intervention. This seems to be the most relevant information, and is like a signal of the "strength of the decision" to smooth the path of the exchange rate. Thus, it seems that the central bank influences the exchange rate basically through the expectations channel (particularly the expectations about future interventions).

In this sense, the BCR "wants to be seen" when it intervenes. The intervention gives the signal that there is excessive exchange rate volatility in the market and that the BCR is going to take the appropriate measures to calm it down. This does not mean, however, that the central bank plays the role of a market maker in the foreign exchange market.

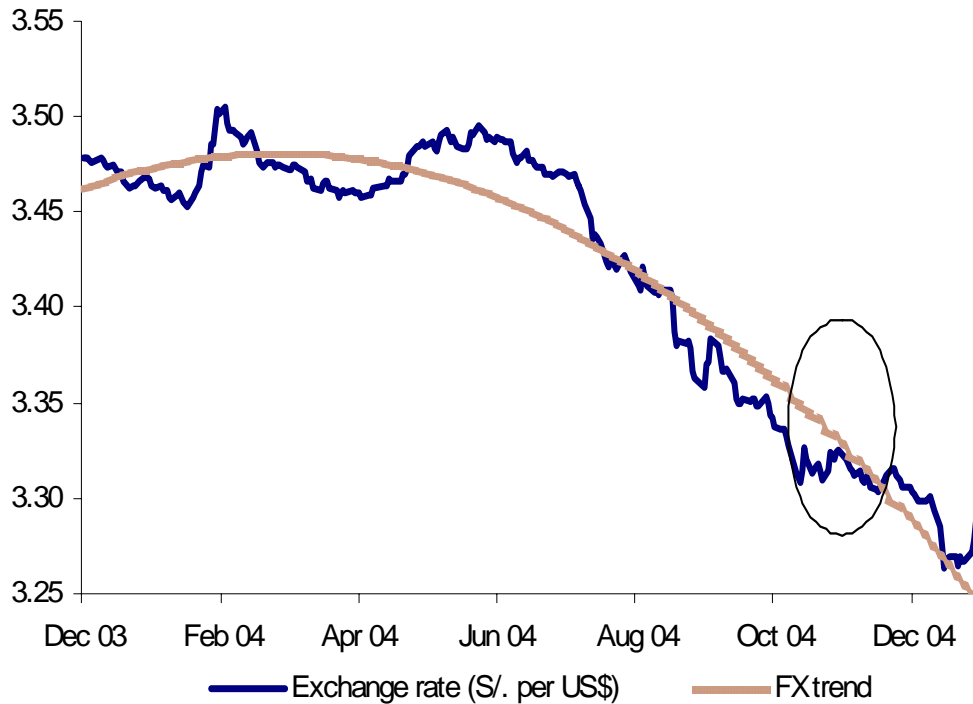
In the case of the portfolio balance channel, the intervention is most likely to be effective when there are anticipated and one-time portfolio currency movements. Otherwise, the effectiveness of the intervention through this channel is low.

Internal studies on the effectiveness of official forex interventions provide empirical evidence that central bank foreign exchange interventions have been effective in reducing exchange rate volatility. According to Flores (2003) and Azañero (2003), forex selling interventions have been effective around two thirds of the time, while forex buying interventions have been a little bit more effective than that. Thus, BCR foreign exchange interventions have been effective most of the time in achieving their main goal, that is, to calm disorderly markets by reducing excessive exchange rate volatility, without any significant difference in effectiveness when the exchange rate is appreciating or depreciating.

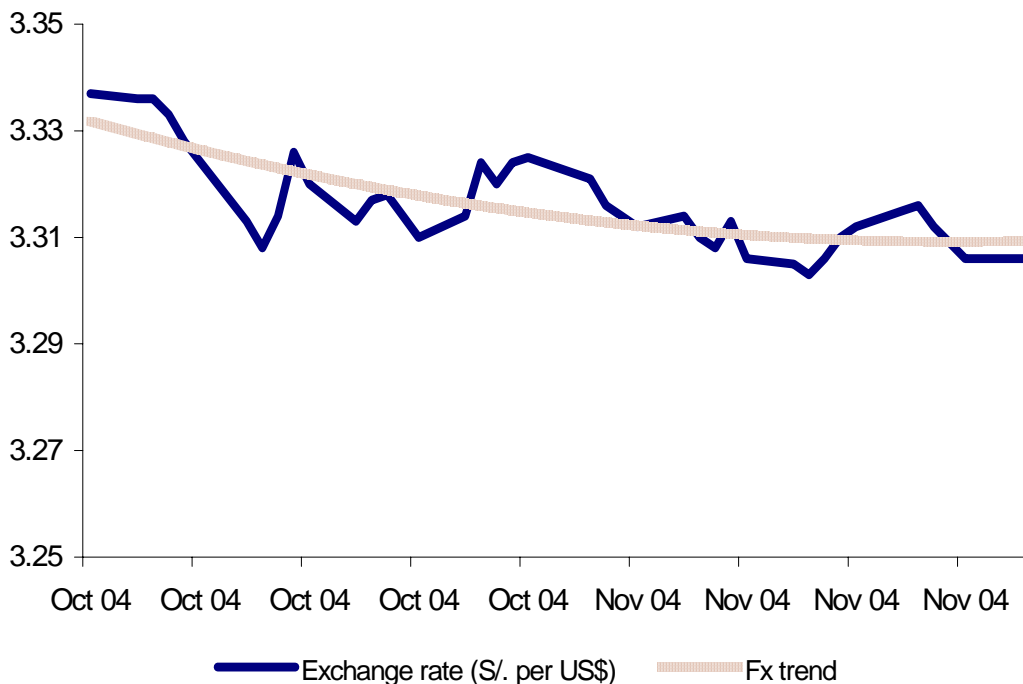
Based on more recent empirical evidence, it may be added that when there have been appreciation pressures on the domestic currency, and forex purchases have been continuous, the effect of the

interventions on the exchange rate seems to have diminished. The explanation to this evidence may be related to the fundamentals that are forcing the appreciation of the Peruvian sol. In this context, forex interventions have tried to smooth - but not stop - the downward trend of the exchange rate in 2003-04. On a shorter horizon (eg October-November 2004), the leaning against the wind goal has been fulfilled.

Exchange rate: December 2003-December 2004



Exchange rate: October 2004-November 2004



4. Concluding remarks

The inflation targeting framework for monetary policy needs the exchange rate to be flexible. However, the design and implementation of policies need to take into consideration that unexpected large domestic currency depreciations are currently too risky for the economy to be tolerated. The reason stems from the fact that there is a high financial dollarisation. Thus, there is a need to smooth the path of the exchange rate.

Forex interventions in 2002 and 2003-04 have succeeded in smoothing the exchange rate path. Additionally, international reserves have increased, which in itself has a positive impact on the reduction of the probability of a domestic financial crisis.

The central bank exchange rate smoothing policy does not aim at keeping a stable exchange rate. If it did, economic agents might perceive that the exchange rate policy supports a stable price for the foreign currency, and this could be taken as an insurance against forex risk from investing in foreign currency assets. This risk insurance would favour financial dollarisation.

In order to keep the interbank interest rate at the policy target level, the central bank needs to sterilise forex purchases. These sterilisation operations imply some costs, which the BCR has had to manage.

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Exchange rate policy and foreign exchange interventions in Poland

Jerzy Pruski and Piotr Szpunar¹

1. The evolution of the exchange rate regime in Poland

Since 1990, Poland has adopted nearly all possible exchange rate regimes, moving smoothly from fixed peg to pure floating. At the beginning of the transition period exchange rate policy was aimed mainly at stabilising the economy. It supported monetary policy in its fight against inflation, playing the role of a nominal anchor. Under the stabilisation plan, the Polish authorities decided to fix the zloty to the US dollar at the level of 9,500 zlotys to one US\$ in January 1990. In that way the government and the central bank delivered a strong nominal anchor for an economy facing dramatic and abrupt adjustments in the real sector and in relative prices. At the same time, the zloty became an internally convertible currency.

The stabilisation plan assumed that the rate of 9,500 zlotys per US dollar would be valid for the first quarter of 1990 only. However, due to a positive current account balance in 1990 it was maintained much longer. Finally, in the environment of a very high inflation, the fixed peg resulted in excessive real appreciation and a loss of price competitiveness for Polish exports. In 1991, Poland faced significant deterioration in its trade balance and current account. As a policy response the zloty was devalued by nearly 17% in May 1991. In addition, the peg to the dollar was abandoned and the zloty was tied to a basket consisting of five currencies: the US dollar (45%), the German mark (35%), the pound sterling (10%), the French franc (5%) and the Swiss franc (5%). That currency composition roughly mirrored the composition of Polish foreign trade.

The fixed exchange rate to the basket lasted until October 1991, when a pre-announced crawling peg system was implemented. It was supposed to constitute a compromise between the anti-inflationary policy and a reinforcement of the competitiveness of Polish goods on the international market. As the rate of inflation was higher than the rate of parity devaluation the real exchange rate was still appreciating. This entailed two further step devaluations, in February 1992 and August 1993.

A breakthrough in exchange rate policy took place in May 1995, when the Polish authorities introduced a crawling band system. This was a very important step towards exchange rate flexibility (which culminated finally in the floating of the zloty exchange rate). It was preceded on the one hand by agreements on the reduction of the Polish debt with both the Paris and the London Clubs, and on the other hand by the liberalisation of foreign exchange regulations. The excessive inflow of foreign currencies put pressure on exchange rate appreciation and, as the administrative barriers to capital flows practically disappeared, the role of foreign exchange interventions in foreign exchange policy conduct increased rapidly. The zloty's rate stuck to the lower limit of admissible fluctuations and therefore, in December 1995, the monetary authorities were forced to revalue the zloty. In 1998-1999 the fluctuation bands were widened several times and finally, in April 2000, the zloty was formally allowed to float freely. That formal decision had been preceded by abandoning foreign exchange interventions in the market from 1998 and in 1999, closing transaction fixing with commercial banks. The floatation of the zloty had an important impact on currency risk and therefore reduced the susceptibility of the Polish economy to currency speculation.

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2. Exchange rate and eclectic monetary policy in the period 1990-1997

The fixed exchange rate as a policy anchor determined the shape of monetary policy conducted in Poland in the period 1990-97, in which the National Bank of Poland was focused on the disinflation process. However, the actual disinflation path was not in line with the one officially targeted. The reason for this discrepancy lay to a large extent in the very procedure of setting the monetary policy targets in that period. The monetary policy guidelines defining the targets for every consecutive year were accepted in a resolution of the lower house of the Parliament (the Sejm). The Sejm usually changed the parameters projected by the NBP, including inflation targets and intermediate targets for broad money growth. In some years the Sejm set unrealistically low inflation targets. It was inspired by the distinct views of the Ministry of Finance, which could in this way achieve lower than planned deficits; higher inflation increased nominal budget incomes, whereas nominal expenditures were mainly fixed. That practice resulted in systematic overshooting of the inflation targets and unfavourably influenced the NBP's reputation.

Table 1
Targeted and actual inflation in 1990-99¹

Year	Target %	Actual %	Deviation % points
1990	95.0	249.3	154.3
1991	32.0	60.4	28.4
1992	36.9	44.3	7.4
1993	32.2	37.6	5.4
1994	23.0	29.5	6.5
1995	17.0	21.6	4.6
1996	17.0	18.5	1.5
1997	13.0	13.2	0.2

¹ Consumer Price Index, December to December.

Source: National Bank of Poland.

Nevertheless, the sustainable disinflation process was intact and still remained the main concern of NBP policy. At the same time, the NBP conducted its exchange rate policy, trying to moderate the appreciation of the zloty - initially mainly by administrative measures. After 1994, when the agreements with both the Paris and the London Clubs on Polish debt reduction were finally settled and the foreign exchange regulations liberalised, the importance of the administrative measures in foreign exchange policy conduct decreased considerably. Their role was taken over by the FOREIGN EXCHANGE interventions. The pre-announced devaluation pace was set lower than targeted inflation, so supporting gradual disinflation. Some tensions, however, were unavoidable as the efficiency of remaining exchange rate controls eroded with time. To depict the role of the exchange rate in the NBP approach it is useful to show the reaction to economic turbulences in 1995.

In December 1994, the Sejm formulated two ambitious targets for the year 1995: 5% GDP growth and reduction in CPI inflation to 17% (from nearly 30% in 1994). Both parameters were exceeded: CPI inflation reached 21.6% and GDP growth 7%, what was mainly due to very rapid export growth. The bulk of that growth resulted from the dynamic development of cross-border trade with Germany, which was experiencing accelerating economic activity and had much higher price levels. The cross-border trade was mainly realised by individuals and small enterprises and, to a large extent, was unregistered. It could only be covered indirectly by official statistics, via recording of net purchases of foreign exchange cash by banks from bureaus of exchange. In response the zloty appreciated. As the profitability of the official exporting industries was low, further appreciation could have led to the elimination of a large group of exporting enterprises and a substantial loss of export markets (hysteresis effect). Under these circumstances the NBP decided to abandon the short-term target for inflation and to protect the zloty from further appreciation using sterilised interventions. The NBP was buying foreign currencies from banks, what inevitably led to growth in the liquidity of the banking

sector. To absorb the increasing liquidity the NBP was conducting open market operations by selling its short-term bills. Huge foreign purchases, stemming from inflows from the surplus in the current account, accompanied by FDI and portfolio investment, generated an enormous increase in foreign reserves (US\$ 9 billion within 12 months, what equalled a 140% increase in reserves).

The assessment of that episode is open to debate. Some argue that keeping high interest rates and pursuing depreciation of the currency is contradictory in itself. In fact the Bank did not manage to keep entirely on course. Facing high foreign exchange inflows the NBP felt itself forced to widen the fluctuation band and finally to revalue the parity. Another strong argument is also put forward in the discussion: the NBP managed to protect the zloty from nominal appreciation (although only partly), but it failed to eliminate its real appreciation (Figure 1). It is, however, easy to notice that in the period in question a use of different deflators to calculate the real exchange rate leads to various outcomes. When the CPI is considered, strong appreciation results, whereas when other deflators (unit labour costs, export prices, PPI) are applied, stability or even depreciation of the real exchange rate is obtained (Figure 2).

Figure 1

Zloty real effective exchange rate (CPI deflated) and H-P trend 1993-2004

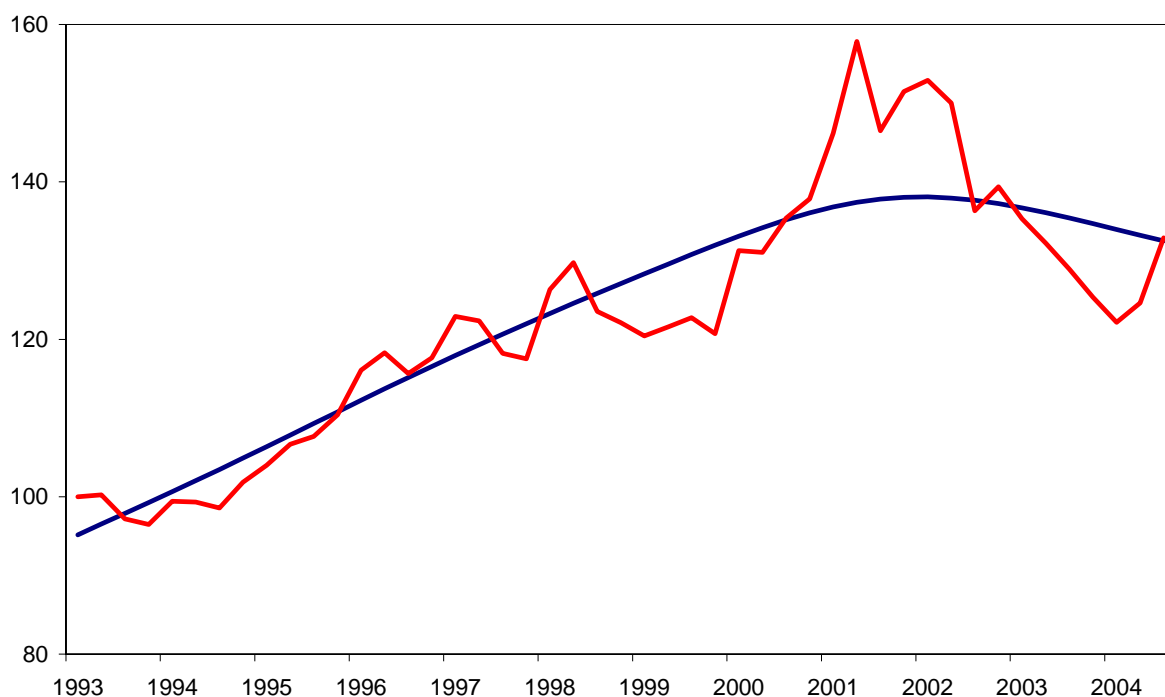


Figure 2

Zloty real effective exchange rate 1993-2004, quarterly data (Q1 1993 = 100)

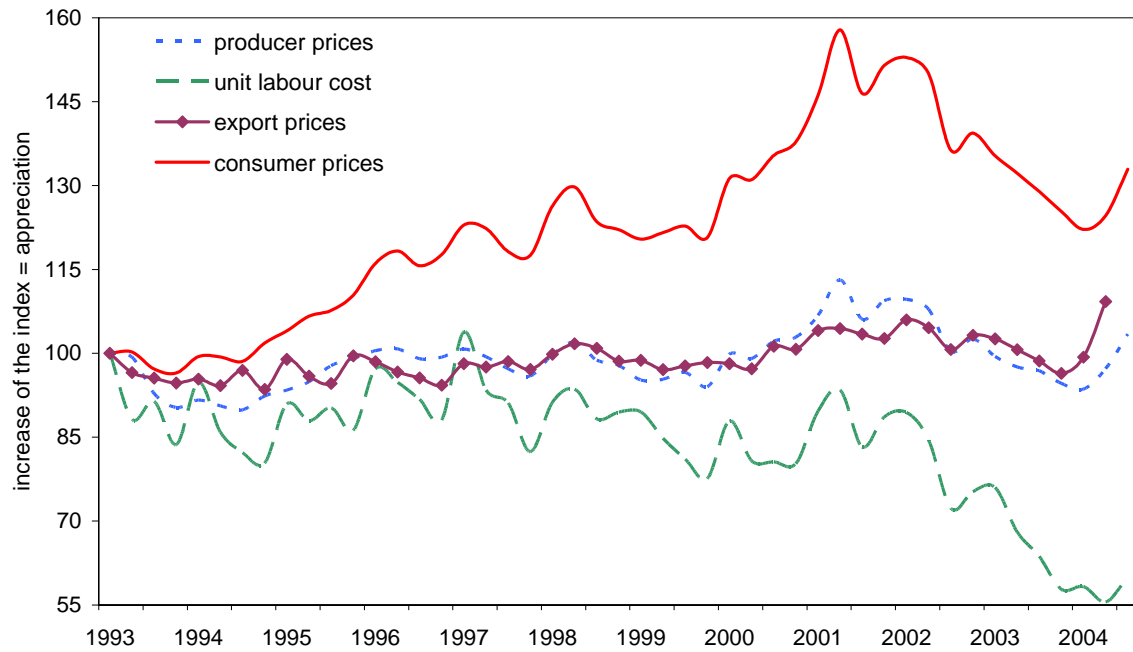


Figure 3

Foreign exchange interventions and nominal effective exchange rate of zloty

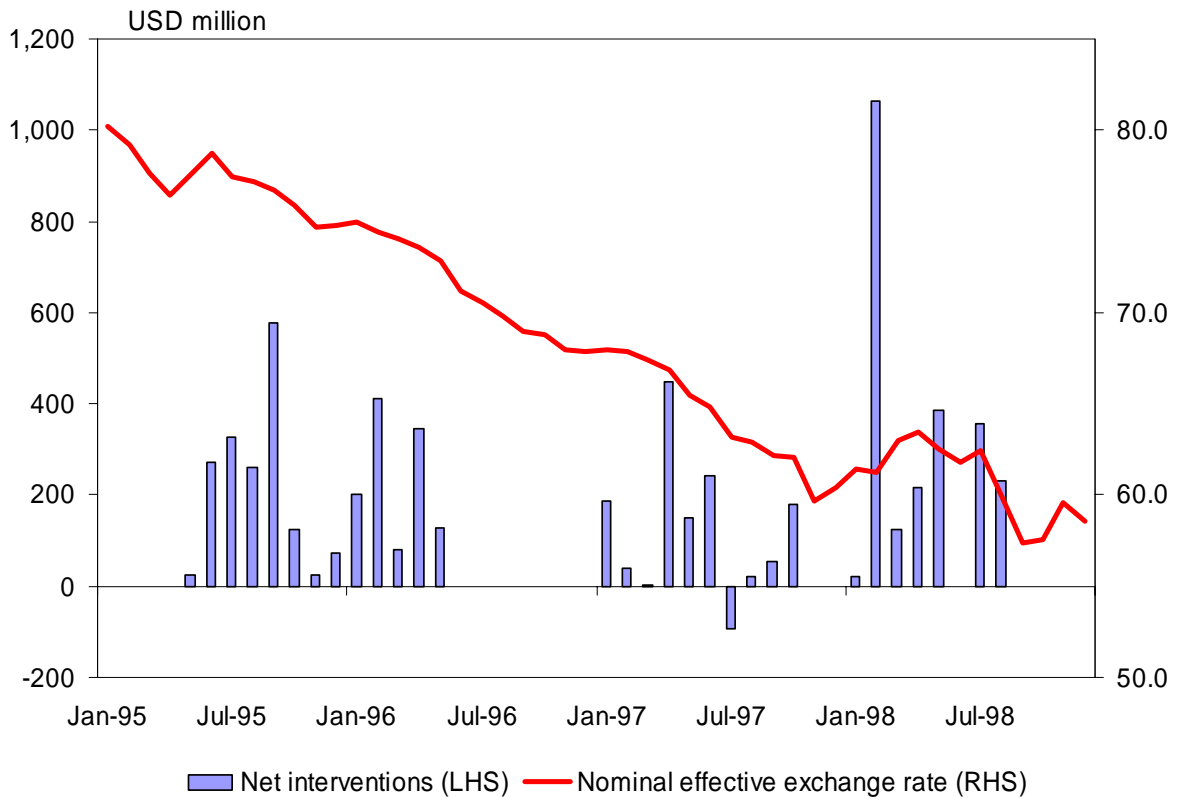
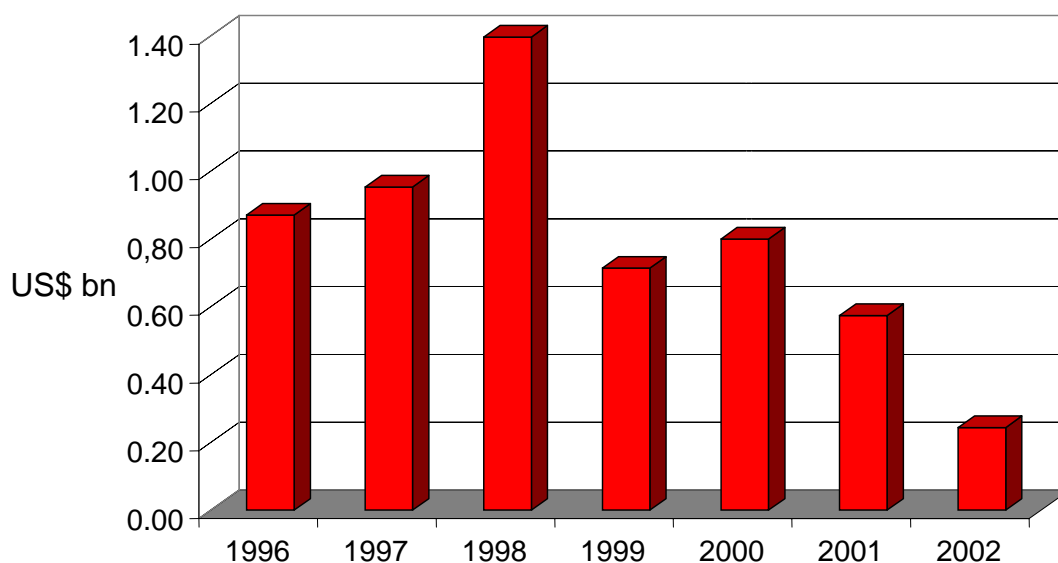


Figure 4
Costs of open market operations



The NBP was also criticised that its policy in 1995 contributed to imbalanced and unsustainable growth in the economy. A strong export-led recovery in 1995 translated into a consumption and credit boom in the following years. In late 1996, the current account deficit rose and started to grow at a very fast pace. High consumption was partly fuelled by expanding credit (in mid-1997 the dynamics of nominal credit to households exceeded 100%). Last but not least, the fiscal cost of sterilised intervention was significant (Figure 4). It resulted from the amount of the liquidity surplus (absorbed in the open market operations) and the interest rate differential.

On the other hand, however, there are also good arguments for a positive assessment of the NBP's policy. First, it is rather obvious that without NBP action in 1995 the Polish economy would have faced a sharp nominal appreciation and - in an environment of sticky prices and wages - the response of real variables to that shock would not have been fast and perfect. Second, the external balance would have deteriorated much faster, bearing in mind that deeper appreciation in 1995 would have eliminated a large part of exporting industry. Moreover, that effect would have been long-lasting, as lost markets are very hard to regain. That would have deepened the risk of currency crises in the late 1990s as the current account deficit rose very fast, reaching its peak at over 8% of GDP in the first quarter of 2000. Third, high, export-led economic growth in 1995 only triggered consumption boom, but the roots of that boom lay elsewhere - in a very low propensity to save and excessively optimistic expectations after a very long period of low consumption. To support that argument it is enough to mention that the policy of very high real interest rates was largely ineffective. The NBP used unconventional methods, such as collecting deposits directly from the public, to hamper expanding consumption. Fourth, excessive domestic demand in the late 1990s was triggered by lax fiscal policies, so that monetary action could have had only limited effects.

All in all, whatever the assessment of the NBP's approach in the mid-1990s, it is unquestionable that the policy of sterilised intervention was flexible and oriented in the long term at a gradual and sustainable disinflation. It was aimed at protecting still fragile economic growth and disinflation process from disruptive shocks in the exchange rate. At that time in the opinion of the NBP there was a risk that sharp appreciation in 1995 would have produced lower inflation in the short run, but would simultaneously have increased the threat of a currency crisis, with its high cost in GDP terms, and of a rebound in inflation.

As the financial markets in Poland were developing very fast, the foreign exchange interventions appeared to be less and less effective. Until 1998 there were two episodes when the NBP managed to maintain the zloty on the devaluation path using foreign exchange interventions. In 1998, despite an enlarged scale of interventions, the depreciation trend was broken (Figure 3).

Abandoning of foreign exchange interventions and the de facto floatation of the zloty in 1998 resulted in a strong appreciation of the Polish currency, but in the context of a much stronger real economy that had been the case in the mid 1990s. Accordingly, although it was costly, the appreciation did not disrupt economic growth.

3. Exchange rate determinants under DIT

Having liberalised capital flows, it is not possible to control both inflation and the exchange rate in the long run, which is a well known paradigm of the “impossible trinity”.² The NBP’s sterilised intervention policy was conducted in the environment of still developing financial markets and not a fully liberalised capital account of the balance of payments.³ That was, however, not enough to avoid the limitations of the sterilised intervention policy. Even at a very early stage of financial development, in 1995, under the pressure of market forces the exchange rate regime had to be changed from a rigid crawling peg to a more flexible crawling band with widened fluctuation margins. A step revaluation of the central parity was also unavoidable. The pressure of the markets increased greatly in 1998, when a deep London-based NDF market for the Polish zloty suddenly developed. The NBP intervened massively in February and then in July 1998, buying on one record day over 0.5 billion US\$ without any sustainable influence on the exchange rate. In response, the NBP stopped its interference in the foreign exchange market and the era of sterilised intervention was definitely over.

In 1998, the newly established Monetary Policy Council (MPC) decided to change the monetary policy strategy of the NBP and introduced a direct inflation targeting (DIT) regime. Published in September 1998, the “*Medium-Term Strategy of Monetary Policy 1999-2003*” set a medium-term inflation target of “below 4% by the year 2003”, and announced a gradual floating of the exchange rate regime. The decision on future floatation of the zloty was a strategic one and was not related to the current market situation. According to the *Strategy*, monetary policy - as implemented until 1998 - could have not been continued in the new environment of advanced integration of the Polish financial markets with the global markets, coupled with lowering investment risk in Poland. As a necessary condition for effective implementation of a new direct inflation targeting regime the MPC recognised a further floating of the zloty was needed. The *Strategy* advocated a smooth evolution toward a floating exchange rate system to allow market participants enough time for preparation and to enable the exchange rate to be brought closer to its equilibrium level before the Polish currency entered ERM II.

The official decision on floating was taken by the government and the MPC in April 2000. It was based on several arguments. First, the free float system is consistent with DIT strategy. Second, it constitutes a self-correcting device, acting as a shock absorber. Third, it extends freedom of monetary policy, as policy makers can increasingly concentrate on domestic developments when setting interest rates, paying less attention to international interest rates differentials. It is worth mentioning that *de facto* floating took place in mid-1998, when the NBP abandoned foreign exchange interventions, and was intensified in 1999, when it ceased organising so-called fixing operations with domestic banks. However, until April 2000, although the admissible fluctuation band of the zloty was very wide, the NBP still announced the central parity. It served as a benchmark for the market, which helped to stabilise the zloty’s exchange rate. After the floating, the volatility of the exchange rate increased significantly with resultant severe appreciation in the period 2000-01 and strong depreciation from 2002 to mid-2004.

The monetary policy conducted between 1998 and 2002 brought about the principal effect of reducing inflation from 13.2% in December 1997 to 0.8% in December 2002. The annual average inflation rate came down from 11.8% in 1998 to 1.9% in 2002, reaching the level observed in developed economies. The disinflation process was successfully ended.⁴ It should be added, however, that some

² Frankel, J A, 1999.

³ Full liberalisation took place from December 2001.

⁴ In 2003, the inflation rate fell considerably below the target, but it was mainly the result of the shocks (negative dynamics of food prices). The rebound of inflation in 2004 was also due to supply shocks in food and raw materials markets coupled with a growth in demand related to expectations of price hikes after Poland’s accession to the European Union. The underlying core inflation was much more stable.

other factors than monetary policy contributed as well to the achievement of that satisfactory result. They included disinflationary supply shocks in both food and fuel markets and slackening of Polish GDP growth, which was unavoidable within a deteriorating external economic environment.

In February 2003, the MPC announced a new strategic document, “*Monetary policy strategy beyond 2003*”, in which it introduced an ongoing inflation target of 2.5% CPI in year-on-year terms with a permissible fluctuation band of ± 1 percentage point either side of this target. In the opinion of the MPC, the above-defined continuous inflation target is consistent with strong economic growth. At the same time, the redefined inflation target comes close to the expected reference value for the Maastricht inflation criterion. From 1998 to 2002, reference values remained between 1.8% and 3.4%, and 2.7% on average. Therefore, an inflation rate stabilised at the level of 2.5% does not guarantee that the inflation criterion is fulfilled. However, any subsequent attempts to adapt inflation to the reference level will not require a substantial reduction in the price growth rate in Poland over a short period of time. Having decided this, the MPC switched to a regular approach to monetary policy under the DIT strategy aimed at stabilising the inflation rate close to the ongoing target.

The strategy of direct inflation targeting assumes abandoning intermediate targets, such as exchange rate management. Instead, the NBP reacts to any available information on factors influencing inflation, in particular developments which could jeopardise reaching the inflation target, including exchange rate movements. Thus, exchange rate volatility is one of the factors that may jeopardise reaching the inflation target. The zloty’s real appreciation/depreciation leads to future inflation decreases/increases, where the partial pass-through coefficient (ie assuming constant wages) is estimated at around 0.2.

The exchange rate, therefore, constitutes a very important element of the monetary transmission mechanism. According to an estimate based on the quarterly macro-econometric model, ECMOD⁵, used in the NBP, the path of the zloty’s real effective exchange rate depends on three factors⁶: the long-term trend of the real exchange rate that hinges on fundamentals such as the real convergence measure and net foreign assets; real interest rate disparity between Poland and its main trading partners; the risk premium parameter.⁷

Consequently, tight monetary policy increases the interest rate disparity and thus leads to temporary overvaluation and hence to an inflation decrease. On the other hand, a lax interest rate policy causes an undervaluation of the domestic currency and an increase in inflation. According to estimates based on ECMOD, raising the base interest rate by one percentage point for six quarters leads to the zloty’s real appreciation by up to 1.5 % (after six quarters). This, in turn, accounts for about half of the fall in inflation that is estimated at about 0.3 percentage points in all.

The modelling of the external sector is one of the key elements in preparing the inflation projection. The management board of the NBP approves the projection prepared by the staff for submission to the Monetary Policy Council, which is the most important input to the Monetary Policy Council’s decision-making process on interest rate setting. Under the floating exchange rate regime the central bank has considerable autonomy in setting its interest rates, which facilitates smoothing output and employment fluctuations, particularly when the economy is hit by asymmetric external demand shocks (or terms of trade shocks).

According to NBP analyses, at present the pass-through effect in Poland is weaker than it used to be during the late 1990s. Even so, it still remains strong, and its changes across the business cycle require further examination. Nevertheless, there is no temptation to use the pass-through effect as a

⁵ See Fic *et al*, 2004.

⁶ For example, according to Rosenberg, 1996, pp 243.

⁷ The current value of the nominal exchange rate is equal to the expected level of the exchange rate in the future, adjusted for the nominal interest rate differential and the risk premium. This baseline UIP formula is transformed into infinite horizon UIP in real terms, ie:

$$q_t = E_t(q_{t+\infty}) + \sum_{i=0}^{\infty} E_t(r_{t+i} - r_{t+i}^*) + \sum_{i=0}^{\infty} E_t(\sigma_{t+i}),$$

where q_t is the real exchange rate, while r_t and r_t^* represent real interest rates. As a result one can decompose the current value of the real exchange rate into expectations of three unobservable factors, as above.

policy tool. It would require employing the exchange rate as an intermediate target directly or in a form of MCI steering. There is broad evidence that having only one instrument, when it is the short-term interest rate, makes it extremely difficult, if not impossible, to steer exchange rate changes smoothly. The MCI steering as a policy rule is also not an attractive alternative. Apart from technical problems with precise defining and computing of the MCI, the changes in the MCI level may send misleading signals for monetary policy conduct.⁸

To sum up, on the one hand, in the case of Poland the effectiveness of a floating exchange rate in neutralising shocks to the Polish economy is confirmed by numerous analyses and is also visible in ECMOD simulations. To illustrate this, let us consider the example of a negative asymmetric external demand shock. First, there is a fall in the volume of exports and a deterioration of the current account. Second, if the contagion effect is present then the risk premium increases. Third, lower domestic demand may prompt the monetary authorities to conduct a more expansionary policy.⁹ All these three factors would lead to a real depreciation of the domestic currency, enabling a partially negative impact of the shock on the economy to be offset. This exchange rate adjustment mechanism occurred during the Russian crisis in August 1998, when the zloty depreciated by 8% within three days.

On the other hand, however, a floating exchange rate may generate unwelcome shocks to the economy. For example, if investors' perception of risk grows, the currency may depreciate without any changes in the economic fundamentals of a country. This may be illustrated by the 5% weakening of the zloty within a week in January 2003, due to disturbances in the Hungarian foreign exchange market (contagion effect). That is why the cost of abandoning the exchange rate after the euro-adoption tends to be overestimated, as the free float is not only a shock absorber but can be also a shock generator.

The superiority of a floating exchange rate over a fixed one as a shock absorber is not a crucial argument for choosing the former. The floating exchange rate is consistent with the DIT strategy and its merits prevail. Unlike exchange rate control, inflation targeting delivers a stable and reliable nominal anchor for the medium-sized economy. That is the decisive argument for the MPC's declaration of willingness to maintain the float until ERM II mechanism adoption.

4. Conclusions

Since 1990, Poland has adopted nearly all possible exchange rate regimes (except for a currency board), moving smoothly from fixed peg to pure floating. Notwithstanding some tensions that occurred during this period, Poland managed to avoid any serious turbulences in the foreign exchange market. That encourages one to draw lessons from that experience.

First, the transition period is usually characterised by shallow financial markets and a fragile real sector. The eclectic policy conducted by the NBP was aimed at protecting the real sector from a shock appreciation of the domestic currency, with sterilised foreign exchange interventions as a main policy tool. Although that policy can still be debated, its results were rather encouraging during the period of economic transformation.

Second, as financial markets developed, foreign exchange interventions appeared to be less and less effective.

Third, a pure DIT regime was launched after a substantial period of gradual floating of the exchange rate, development of financial markets and growing productivity of enterprises. The gradual approach to floating the currency seemed to help economic agents to cope with higher volatility of the exchange rate and the episodes of severe appreciation.

⁸ Consider, for example, a case of inappropriate reaction on the part of the central bank of New Zealand (RBNZ) to an MCI change, stemming from the fall of external demand triggered by the Asian crisis of 1997. In response to the resultant depreciation of the NZ dollar, RBNZ raised interest rates, which led to unnecessary contraction in domestic demand and finally to a period of subdued economic growth.

⁹ It is, however, possible that currency depreciation may also invoke inflationary pressure and hence interest rate hikes. Which effect prevails, depends on the structure of the economy.

Annex Table 1

Exchange rate system history in Poland between 1990 and 2002

Period	Exchange rate system	Characteristics
Before 1990	Fixed rate against basket of currencies	Frequent and significant devaluations
1/1/1990	Devaluation (46.2%), fixed against US dollar	Exchange rate as anti-inflationary anchor
17/5/1991	Devaluation (16.8%). Fixed rate basket of five currencies	Real appreciation and strong decline in competitiveness
15/10/1991	System of crawling peg with monthly rate of devaluation levelled at 1.8%	Attempt to reconcile disinflation objective and maintaining competitiveness of exporters on the world market
25/2/1992	Devaluation (12%)	Improved competitiveness
27/8/1993	Devaluation (8%), monthly rate of devaluation 1.6%	Low level of foreign reserves and the reduction of inflation
13/9/1994	Monthly rate of devaluation 1.5%	Tightening anti-inflationary policy
30/11/1994	Monthly rate of devaluation 1.4%	Falling inflation
15/2/1995	Monthly rate of devaluation 1.2%	
6/3/1995	Increase in fluctuation band for transactions NBP/banks to +/- 2% around NBP parity	
16/5/1995	Implementation of crawling band system, with fluctuation band amount +/- 7%	Higher flexibility of the foreign capital inflow management
22/12/1995	Revaluation of the zloty exchange rate (6%)	Increased inflow of short-term foreign capital
8/1/1996	Reduction of monthly devaluation rate to 1.0%	Exchange rate policy subjected to inflation targeting
25/2/1998	Reduction of monthly devaluation rate to 0.8%	
	Expanding fluctuation band to +/- 10%	
17/7/1998	Reduction of monthly devaluation rate to 0.65%	
10/9/1998	Reduction of monthly devaluation rate to 0.5%	
29/10/1998	Expanding fluctuation band to +/- 12.5%	
1/1/1999	New currency basket: 55% euro and 45% dollar	
25/3/1999	Reduction of monthly devaluation rate to 0.8%	
	Expanding fluctuation band to +/- 15%	
12/4/2000	Floating the zloty: adopting free-floating system	Higher currency risk, lower opportunity of currency speculation

Source: National Bank of Poland

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Foreign exchange intervention in Saudi Arabia

Muhammad Al-Jasser and Ahmed Banafe

1. Introduction

Saudi Arabia has a fixed exchange rate regime, with the riyal pegged to the US\$. The dollar/riyal exchange rate has remained fixed at 3.75 since June 1986. As foreign exchange is predominantly earned by the government, the Saudi Arabian Monetary Agency (SAMA) provides the foreign exchange needs of the private sector by selling dollars against Riyals to the domestic banks.

Typically, speculation against the riyal tends to be in the forward market (due to its off-balance sheet characteristics) in times of oil market weaknesses combined with falling foreign exchange reserves. SAMA intervened in the forward foreign exchange market on two occasions - August-December 1993 and July-September 1998.

2. Macroeconomic considerations

As a resource-based economy, Saudi Arabia's reliance on oil revenues for budget formulation is quite pronounced. Oil revenue constitutes about 75% of total government revenue. It may be noted that the oil sector's contribution to GDP is about 35% and the non-oil sector's (private sector and government) about 65%. Saudi Arabia's nominal GDP growth averaged 5% pa and the cost of living index about 1% pa during the 1990s. The current account balance of payments position has turned positive since 1999, with noticeable surplus build-up lately both in absolute terms and as percent of nominal GDP. The government's commitment to pursue prudent fiscal policy, combined with better oil revenues in 2003 and 2004, resulted in budget surpluses in 2003 and 2004, which has been helpful in paying down debt.

The fixed exchange rate regime has worked well in Saudi Arabia due to the country's foreign currency receipt and payment pattern and the mandatory 100% currency backing by foreign exchange reserves. The currency backing factor puts a ceiling on currency in circulation (it cannot exceed foreign exchange reserves). SAMA foreign exchange operations are conducted within the confines of the regime attributes. Forward intervention in defence of the domestic currency could create vulnerability for countries with excessive short-term foreign currency liabilities and a weak banking system. Saudi Arabia's net creditor position and a strong banking system have been supportive in curbing sporadic forward exchange rate volatility and stabilising the market. In the event of forward intervention, SAMA's outstanding forward contracts with counterparties would settle only when they made payments in riyals to take delivery of their forward dollar purchases. As SAMA has full control on the supply and availability of riyals, short riyal sellers would find it both difficult and costly to honour their part of the commitment.

3. Governance and motives

SAMA chooses the foreign exchange regime in consultation with the government but foreign exchange intervention is carried out at SAMA's discretion within the confines of the exchange rate regime. SAMA has operational and goal independence. SAMA's foreign exchange intervention has been infrequent and goal-specific, ie maintaining exchange rate stability and preserving financial stability. Accumulation of foreign exchange reserves via foreign exchange intervention has not been a policy objective.

As for Riyal exchange rate adjustments against the dollar, they are initiated by SAMA, coordinated with the Minister of Finance and endorsed by the Head of the Council of Ministers. During the 1970s, frequent dollar/riyal exchange rate adjustments were made within the technical framework of the

±7½% margin relative to the riyal's parity of 4.28255 against the SDR, expressed in dollar terms. The margins were suspended on 22 July 1981 to avoid having to devalue the riyal beyond the margins for technical reasons as the dollar kept on rising against the SDR during the first half of the 1980s.

4. Causes of speculation

They are listed below in order of importance and interconnections:

- Falling oil prices and oil revenue
- Falling foreign exchange reserves
- Balance of payments considerations
- Negative press
- Real effective exchange rate
- Contagion effect

During the first half of 1986, speculation against the riyal was triggered by a combination of lower oil prices, widening budget imbalances, falling foreign exchange reserves and a deteriorating balance of payments position. Against these macroeconomic odds, Saudi Arabia devalued the riyal in June 1986 from 3.65 to 3.75 to the Dollar. The small devaluation of the riyal by 2.7% against the dollar was meant to signal to the market that balance of payments considerations warranted devaluation. In fact, the riyal's devaluation against major floating currencies has been much higher by virtue of its peg to the dollar, which was on the course of a sharp downward correction during the mid 1980s.

During 1993, negative press about Saudi Arabia's twin deficits (budget and balance of payments) and falling foreign exchange reserves in the aftermath of the Gulf War caused speculation against the riyal. The situation did not warrant riyal devaluation but a timely intervention in the forward market.

During 1998, speculation against the riyal was linked to oil market weakness following the Asian market crisis and its implications for global growth. Exaggerated movements in forward prices warranted intervention in the forward market.

In all the above cases, the oil market weakness has been a catalyst for speculation. This is because of a misconceived perception that a devaluation of the riyal would result in higher revenue (translation effect). Typically, the translation effect is offset by the transaction effect in Saudi Arabia's open economy. Foreign exchange operators/speculators are short-term punters seeking to benefit from their short riyal positions in the event of a devaluation. They mistakenly conceive that a riyal devaluation raises government revenues and a riyal revaluation results in losses to government on its (a) foreign exchange reserves and (b) riyal revenue derived from oil sales in dollars. It may be noted that translation effect in respect of (a) is accounting and not economic, as higher riyal revenues via currency devaluation are largely offset by the higher cost of imports. Translation effect in respect of (b) is relevant to the extent of net domestic expenditure. There is no exchange effect on direct government expenditure incurred abroad. The component of government expenditure which is exclusively in riyals (payrolls and purchases of goods and services in the local market) is to a certain extent offset by exclusively riyal revenues. A depreciating riyal would inevitably increase the riyal cost of any foreign exchange component of domestic purchases made by the government. It follows that any gains to government revenues in riyal terms from a devaluation of the riyal against the dollar are rather illusory unless justified by macroeconomic reasoning/balance of payments considerations.

5. Intervention tactics and their effectiveness

Speculation in the forward market pushes up foreign exchange swap points, resulting in higher interest rates. Domestic banks, being market makers, keep on adjusting their forward quotations for each incremental transaction amount, as they ultimately seek to cover short forward dollar positions by buying dollars from SAMA. The consequent drain in system liquidity exacerbates interest rate rises. Operationally, longer-dated forwards are targeted in anticipation of a riyal devaluation or higher

discounts in the intervening period. Speculation, if left unchecked, would lead to market destabilisation and have cost implications for the economy.

SAMA's intervention policy is to intervene in foreign exchange markets on a discretionary, rather than a systematic basis, and only in exceptional circumstances to counter disruptive short-term movements in the riyal money market. SAMA's intervention may be characterised as both passive and active. In terms of passive intervention/foreign exchange operation's, SAMA keeps on providing spot dollars to the market regularly to meet the private sector's foreign exchange requirements. Given this set-up and the fact that speculative pressure tends to be in the forward market, active or proactive intervention appears to be appropriate in the forward market. There are concerns in some circles that the leveraging factor in the forward market could pose a serious problem for the authorities in honouring their commitments, and subsequently forcing them to devalue or float the currency. This argument holds for overvalued currencies vulnerable to unsustainable capital inflows (eg the Asian financial market crisis of the late 1990s).

SAMA's intervention tactics included gathering relevant information from the domestic banks, such as size of open positions, origin of transactions and volume of trading. SAMA conducted both direct and indirect (via agents) intervention and let the market know about it ex-ante. SAMA's experience has been quite positive in smoothing disruptive market movements and curbing volatility in forward pricing through small-sized forward intervention.

SAMA intervened in late 1993 and Q3 of 1998 when the dollar/riyal interest rate differential ranged between 1 and 2%, as opposed to $\frac{1}{4}$ to $\frac{1}{2}$ % in normal times. At times, forward intervention was backed by money market intervention in the form of liquidity injection through deposit placements and foreign exchange swaps to make a pronounced effect in lowering swap points. Intuitively, if intervention yielded a profit, it would reduce exchange rate volatility, and if it entailed losses, it would be an additional source of exchange rate instability. On both occasions, SAMA's modest intervention totalling US\$ 655 m in 1993 and US\$ 820 m in 1998 worked in stabilising the market (ie achieving the ultimate objective). This indicates unsustainability of speculative action against economic fundamentals underpinning the currency.

6. Cost of speculation

As Saudi riyal interest rates track US dollar rates due to the exchange rate peg, it is initially inexpensive to speculate against the riyal (the narrow interest rate differential means a small forward premium for the Dollar). Generally, higher interest rates are seen as a necessary consequence of the defense against speculation.

Arguments in favour of interest rate support might sound reasonable to some extent, but the authorities' prolonged indifference could have cost implications for businesses and economic activity. Excessive volatility in market conditions and exchange rate overshooting would warrant official intervention to steady the foreign exchange market and manage domestic interest rates. In fact, interest rate support for the exchange rate or interest rate penalty for speculators could be short-lived unless accompanied by sound macroeconomic fundamentals.

In Saudi Arabia, the cost of defending the peg in 1993 and 1998 was insignificant to the overall economy judging by the small size of intervention and the short period of volatility. This has partly to do with the absence of hot money inflows and the sound banking system. Though profitability from foreign exchange intervention was not an objective, it resulted nonetheless when forward contracts were liquidated.

7. Domestic implications

The government is the major source of foreign exchange supply, being the sole recipient of oil revenue. Operationally, SAMA's routine sales of dollars to the domestic banks are meant to meet the private sector's commercial and financial demand for foreign currencies. Under normal circumstances, foreign exchange operations have no discernible effect on money market conditions. In the event of excessive foreign exchange outflow for speculative or event-specific reasons, there tends to be an

imbalance in system liquidity, causing interest rates to rise. However, application of liquidity instruments, such as repos and foreign exchange swaps, has been instrumental in addressing money market disequilibrium to a large extent. Given the steady supply of foreign exchange to the private sector through the domestic banks, sporadic speculation against the riyal has been in the forward market. SAMA's foreign exchange intervention in the forward market did not have to be sterilised, as forward intervention is a less costly means of conducting sterilised intervention.

8. Conclusion

SAMA's intervention in the light of the foregoing can be summed up as follows:

1. SAMA succeeded in breaking the momentum by "leaning against the wind" (acting against the basic trend which is more relevant in the case of managed currencies) and stabilising the market.
2. The profitability criterion (used for measuring success or failure) was satisfied.
3. From a longer-term perspective, forward foreign exchange intervention might not lead to a drastic drain of reserves, given SAMA's control on the supply and availability of riyals.
4. Finally, cognisant of the fact that there is no alternative to fostering sound monetary and fiscal measures to steer the market in an orderly manner and maintain public confidence in the currency, Saudi Arabia paid close attention to macroeconomic stability (including the exchange rate) through fiscal adjustments reflecting the revenue pattern and through avoidance of foreign currency borrowing to finance the budget deficit.

Appendices (tables and graphs)

- a) US\$/riyal (SAR) official exchange rates
- b) Current account balance
- c) Real effective exchange rates
- d) US\$/SAR spot rates and swap rates

Graphs are self-explanatory showing pre- and post-intervention price movements.

US\$/SAR official selling rates

	Rate	% Change
End December 1960	SAR 4.50	-
End December 1971	4.145	8.5
End December 1973	3.56	16.6
End December 1975	3.54	0.5
End December 1977	3.50	1.0
End December 1978	3.30	6.1
End December 1979	3.37	-2.1
End December 1980	3.33	1.2
End December 1981	3.42	-2.6
End December 1982	3.44	-0.6
End December 1983	3.50	-1.7
End December 1984	3.58	-2.2
End December 1985	3.65	-1.9
End December 1986	3.75	-2.7

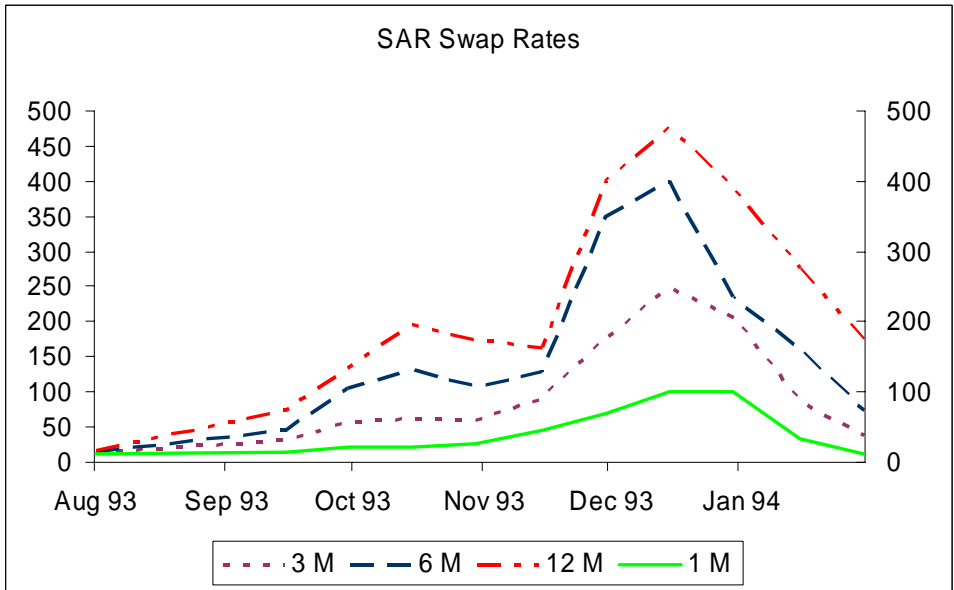
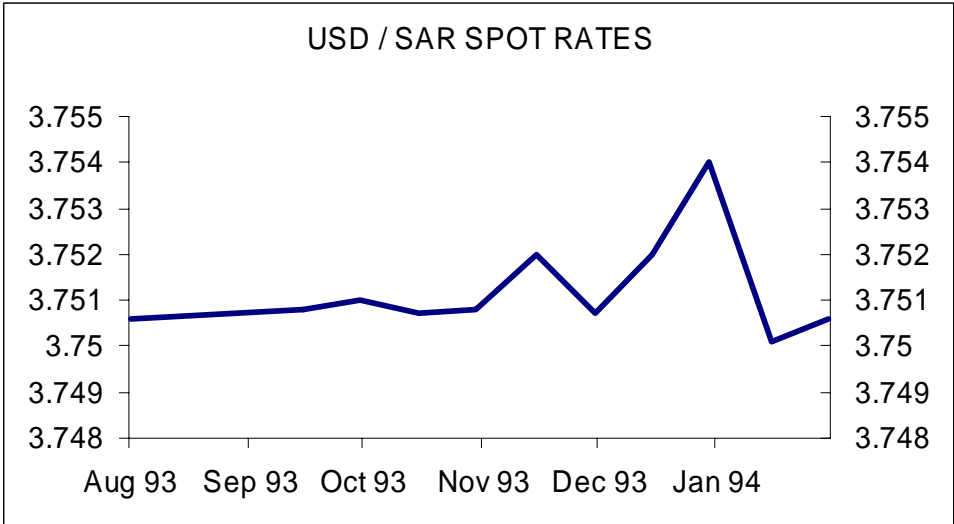
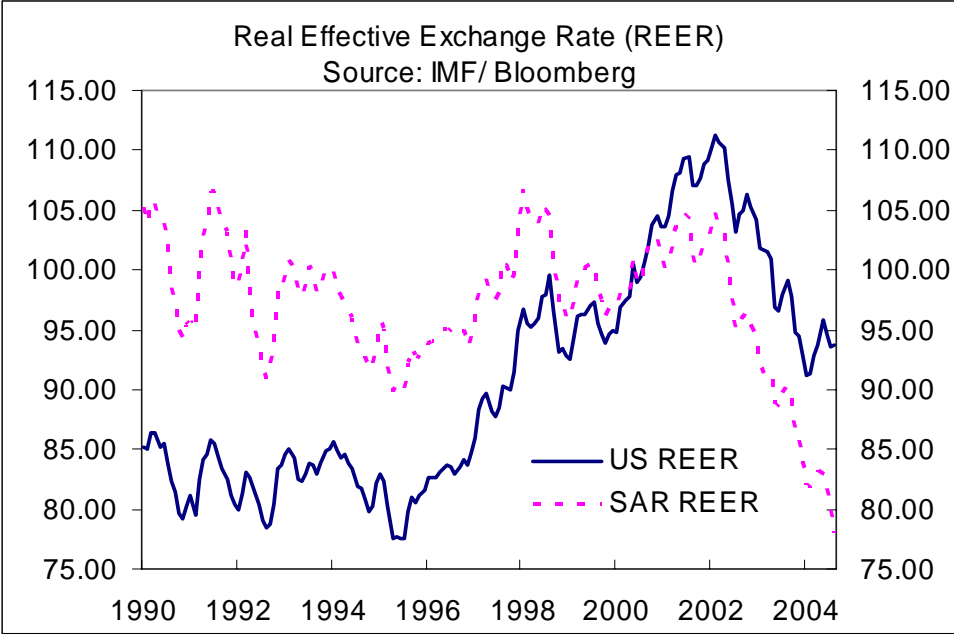
Current account balance

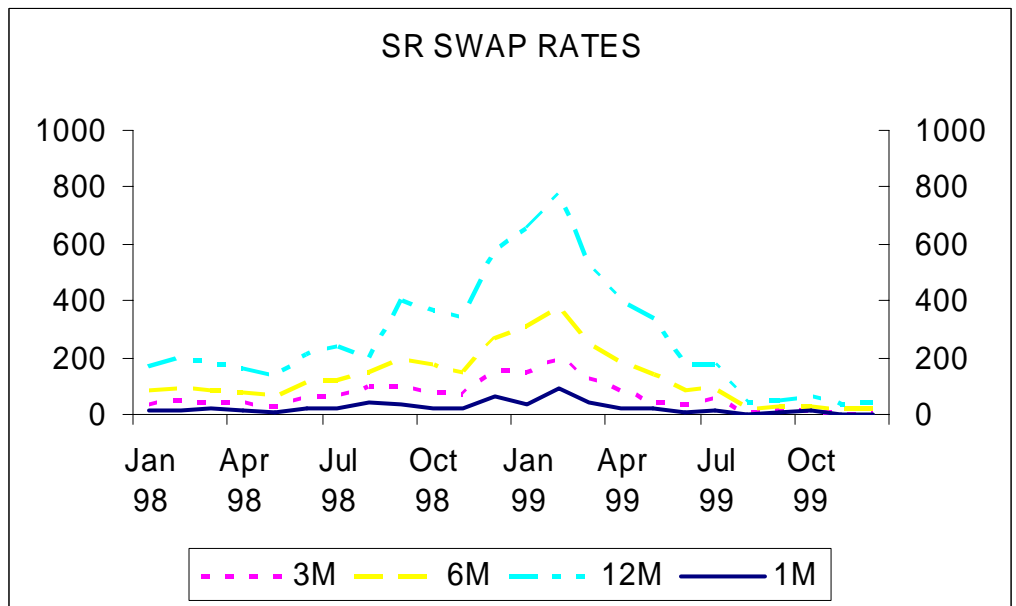
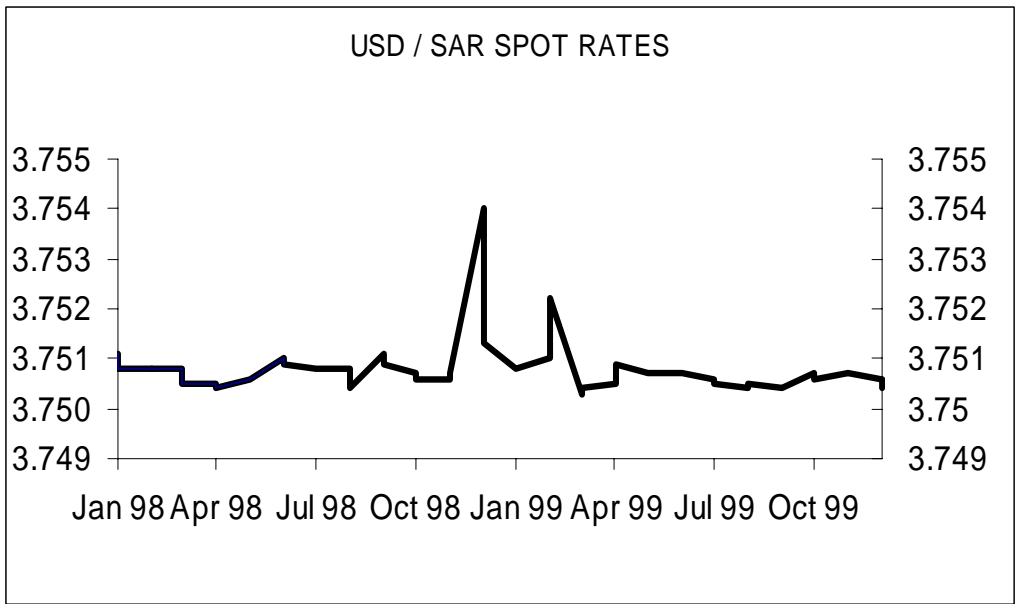
(in SAR billion)

	Trade account	Services and transfers	Current A/C balance	Current A/C as % of GDP
1991	80.8	-184.4	-103.6	-21.1
1992	74.6	-141.0	-66.4	-13.0
1993	61.4	-126.1	-64.7	-13.1
1994	79.3	-118.6	-39.3	-7.8
1995	90.9	-110.8	-19.9	-3.7
1996	131.9	-129.3	2.6	0.4
1997	128.1	-127.0	1.1	0.2
1998	41.9	-91.2	-49.3	-9.0
1999	93.3	-91.7	1.6	0.3
2000	185.8	-132.2	53.6	7.6
2001	146.9	-111.9	35.0	5.1
2002	159.9	-115.4	44.5	6.3
2003	229.4	-118.1	111.3	13.8
2004 ^e			193 ^e	20.7 ^e

Exchange rate: SAR 3.75 per US dollar since June 1986.

Source: SAMA Annual Reports.





South Africa: official foreign exchange operations

South African Reserve Bank

Purpose: strengthening foreign exchange reserves

1. Official foreign exchange operations in South Africa are directed towards gradually strengthening the official foreign exchange reserves.
2. In recent years, reserves have been negative on a net basis, with a negative forward position exceeding holdings of spot reserves. With the rand recovering since 2002 from a sharp fall in the second half of 2001, the South African Reserve Bank has since March 2003 been operating in the market to purchase foreign exchange, on a moderate and gradual basis, with the aim of rebuilding the foreign exchange reserves to a reasonable level. The approach, by “creaming off” (purchasing) foreign exchange when the market is active, but explicitly not seeking to set any level for the rand, or to resist market movements, is consistent with the Reserve Bank’s overall monetary policy framework, which is based on inflation targeting and a floating exchange rate.
3. This process of rebuilding foreign exchange reserves has yielded good results over the past two years. When the Reserve Bank began “creaming off” (purchasing foreign exchange gradually in the market) in March 2003, the net reserves position was US\$ 1.4 billion negative (with the negative forward book standing at US\$ 6.8 billion). Purchases in the market were initially applied to reducing the negative forward book. In February 2004, the negative forward book was finally squared off. Thereafter purchases in the market have been applied to building up the gross reserves. Reserves currently (end-December 2004) stand at US\$ 14.9 billion gross and US\$ 11.4 billion net (see graph).
4. Buying foreign exchange for this purpose on a continuing basis in the market has required careful judgement by the Reserve Bank’s management as to the pace and scale of purchases, and clear communication to the market of the policy purpose being pursued; and it has also required considerable professional skills by the Reserve Bank’s foreign exchange dealers. It has been important to conduct operations, and communicate with the market, so that the market understands that the exercise does not in any way compromise the Reserve Bank’s inflation targeting framework, and in particular does not imply any attempt to manage the exchange rate, but is instead directed at taking opportunities when the market is active gradually to strengthen the foreign exchange reserves.
5. This exercise has clearly been helped by the general tendency of the rand to appreciate over the past three years, partly as a natural recovery from its temporary undue fall in the second half of 2001 and partly also reflecting the general weakening in the US dollar. In the process, the policy of purchasing foreign exchange to rebuild the reserves has helped at times to moderate the pace of the upwards adjustment of the rand. It has also materially reduced volatility in the currency, a process also helped by the steady improvement in international confidence in the economy to which the strengthening in the reserves has materially contributed: hence South Africa’s recent rating upgrade from Moody’s.
6. As an important element in communicating its policy purpose, the Reserve Bank publishes, within a few days of the end of each month, a full statement of its reserves, the changes over the past month and an explanation of the main changes. This has helped the market to understand the manner in which “creaming off” is conducted and to accept that it is being pursued in a way that in no way conflicts with the Reserve Bank’s inflation targeting framework.
7. There is no specific target for the level of the reserves. The aim is gradually to build reserves to a level where the standard ratios of reserves adequacy, as applied by analysts and the rating agencies, puts South Africa broadly in line with normal levels for countries at South Africa’s stage of development.

8. Beyond operations designed to strengthen foreign exchange reserves, the Reserve Bank executes normal customer operations on behalf of the government and other customers, and may from time to time smooth the execution of one-off large transactions in the market. But intervention designed to manage the exchange rate is not conducted. The exchange rate is determined by market forces and underlying movements in the exchange rate are taken into account in the decision of the Reserve Bank's Monetary Policy Committee in setting interest rates in order to maintain inflation (CPIX) continuously within the set target range of 3-6%.

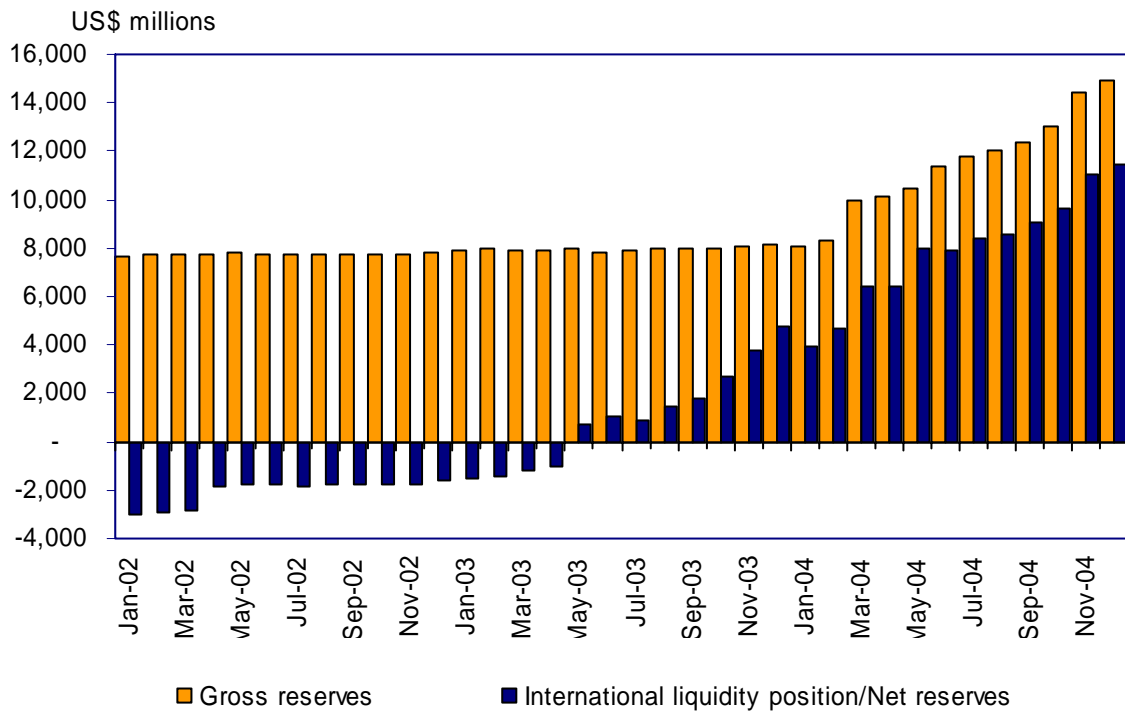
Organisation of foreign exchange operations

9. The official foreign exchange reserves are held by the South African Reserve Bank and appear on its balance sheet. Gains/losses in domestic currency terms are, however, booked to the account of the government and the resulting net balance of gains/losses is settled annually between the National Treasury and the Reserve Bank.
10. Operations are undertaken by the Reserve Bank working within the framework of cooperation and communication provided for by working committees of National Treasury and Reserve Bank officials that monitor areas of common interest. Policy on official foreign exchange operations is made fully public, through regular communications, including monthly publication of reserve figures, and through policy announcements where necessary. The move to purchasing foreign currency to strengthen the reserves was announced when it was initiated in March 2003.
11. A proportion of the reserves is financed by medium-term borrowing from banks, on a syndicated or bilateral basis, by the Reserve Bank. Such borrowing currently amounts to US\$ 3.5 billion. The remainder of the gross reserves of US\$ 14.9 billion, ie the net reserves of US\$ 11.4 billion, was financed in rand by purchases in the market. In addition, the National Treasury occasionally issues international bonds in foreign currency, the proceeds of which are typically sold to the Reserve Bank and added to the reserves, with the rand proceeds of the sale contributing to financing the government's budget. Foreign currency borrowing by the government represents only a minor component of its budget borrowing, the bulk of which is financed in the domestic bond market, which is well developed.

Domestic implications

12. All purchases of foreign currency for the reserves are fully sterilised in terms of their impact on domestic liquidity. The instruments the Reserve Bank utilises for this purpose are (reverse) repos of part of its holding of government bonds and the sale of Reserve Bank debentures, both generally at one-month maturities, along with occasional outright sales of government bonds to drain liquidity on a permanent basis.

Official gold and foreign exchange reserves



Foreign exchange policy and intervention in Thailand

Financial Markets Operations Group
Bank of Thailand

I. Introduction

This paper summarises information on how Thailand conducted its foreign exchange rate policy after the float. A special emphasis is given to intervention motives and techniques. It also outlines some foreign exchange measures used in deterring speculative flows.

Since 2 July 1997, Thailand has adopted a managed-float exchange rate regime, replacing the basket-peg regime which had been in operation since 1984. The value of the baht has since then been largely determined by market forces. The Bank of Thailand manages the exchange rate by intervening in the foreign exchange market from time to time in order to prevent excessive volatilities in the markets, while fundamental trends are accommodated. In other words, movements in the exchange rates which are in line with the changes in economic fundamentals and financial development would only be smoothed and not resisted.

The managed-float exchange rate regime together with the inflation targeting framework, which was formally introduced in May 2000 with short-term interest rates as the operating target, has worked well for Thailand. The inflation target performs the role of a new nominal anchor for monetary policy while flexibility in exchange rates helps absorb shocks to the economy.

Since the adoption of the managed-float exchange rate regime, the Thai baht has generally moved in line with economic fundamentals. However, extreme exchange rate movements have occasionally occurred due to various causes. As a result, different combinations of techniques and tactics were used depending on the market conditions. Broadly speaking, the Bank of Thailand focuses on containing excessive and persistent exchange rate volatility and intervenes when exchange rate movements appear to be inconsistent with fundamental changes. Short-term volatility is not a major concern unless it persists and becomes a threat to stability.

The rest of this paper is organised as follows. The next two sections briefly describe recent developments in the foreign exchange market and an institutional setup as background information. Section IV then explains why the Bank of Thailand intervenes in the foreign exchange market, while section V elaborates how foreign exchange policy is carried out. The last section on the information disclosure describes our view on transparency issue.

II. Developments in the foreign exchange market after the float

Since the float, exchange rates have generally moved in line with economic fundamentals. Figure 1 shows how the baht has moved against the US dollar since the float. The baht/US dollar exchange rate fluctuated widely from 36-56 baht/US dollar. However, in the past few years, the exchange rate has been relatively stable as reflected in the considerably lower volatilities.¹ In effective terms, however, the NEER and REER, shown in Figure 2, were relatively stable as most regional currencies had generally moved in tandem.

¹ Volatility is measured by the annualised standard deviation of daily returns (percentage change in exchange rates).

Figure 1

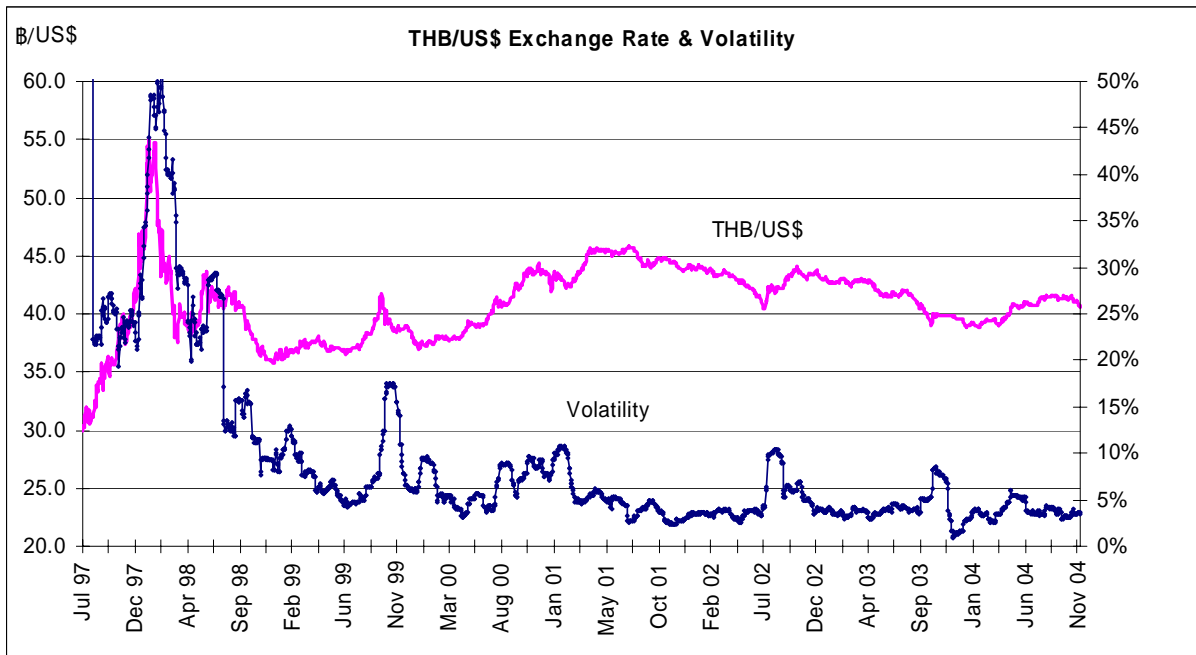
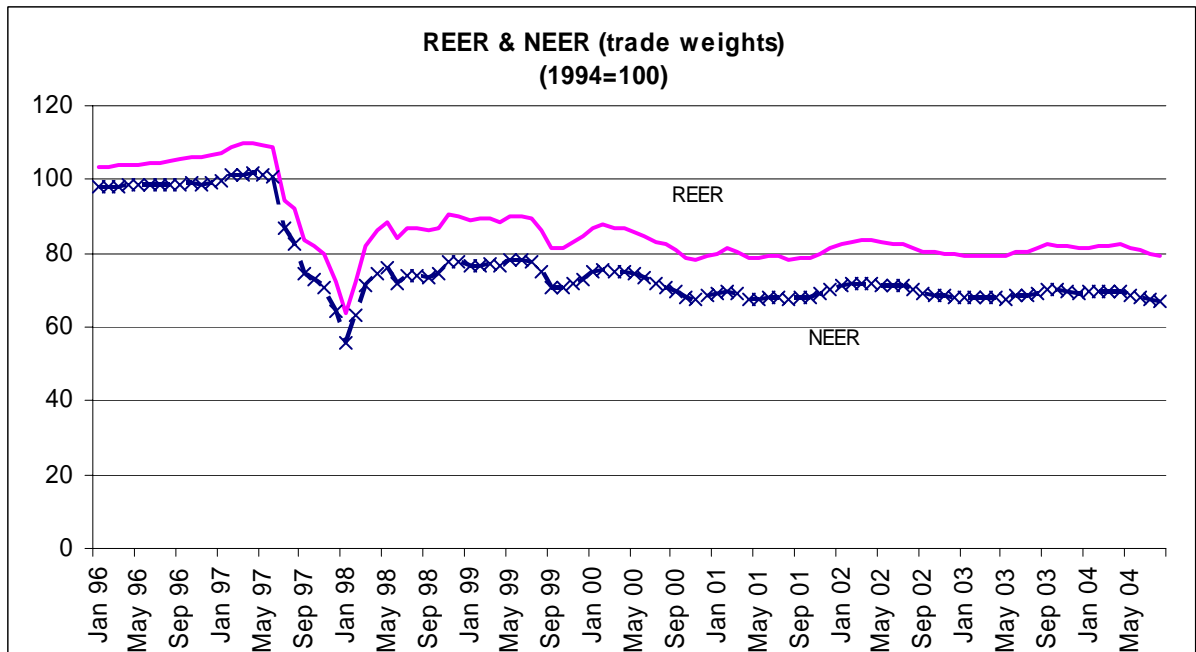


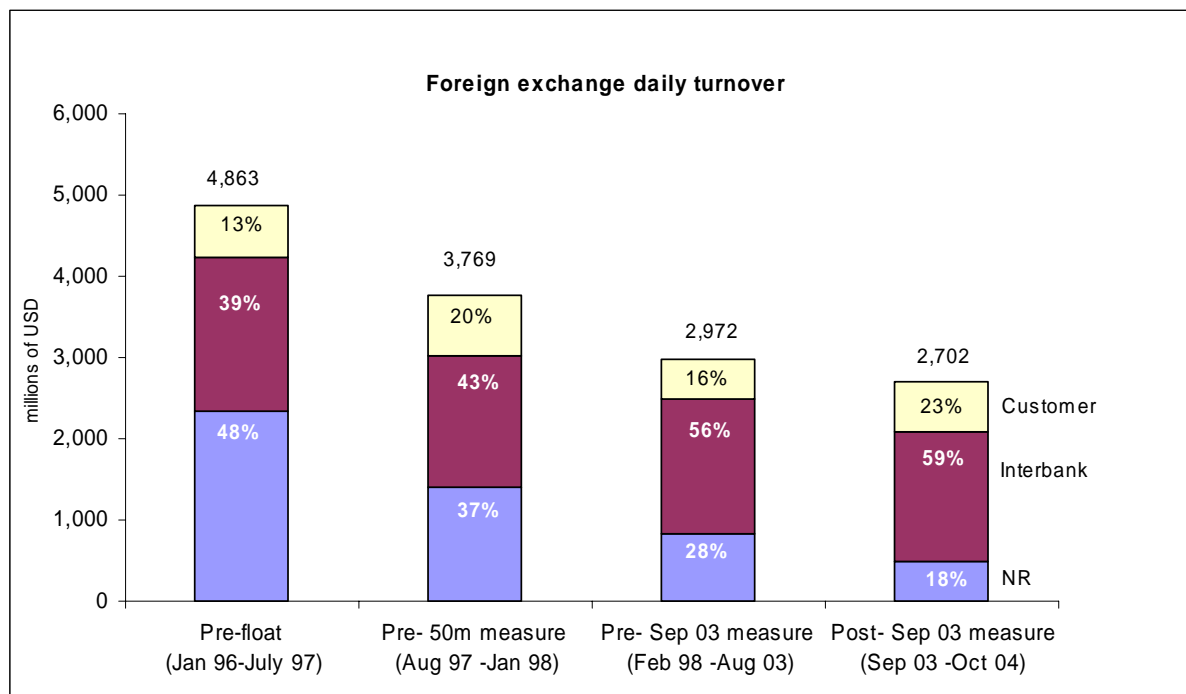
Figure 2



Offshore financial institutions have long been major players in the Thai foreign exchange market since there are no regulations on foreign exchange trading in the spot market. Offshore players have always accounted for a significant share of foreign exchange market volume until recently (September 2003), when restrictions were imposed on non-resident baht accounts (NRBA) and short-term liquidity management following a surge in capital inflows which were deemed speculative in nature. As can be seen in Figure 3, non-residents accounted for around half of the average daily trading turnover in all foreign exchange transactions (spot + forward + foreign exchange swap) before the baht was floated. As foreign exchange regulations were imposed, the proportion of non-resident (NR) trading gradually declined. Since September 2003, when measures to deter short-term speculative inflows were put in

place, non-residents have been considerably less active in the Thai baht market. Their share has fallen to less than 20%.

Figure 3
Foreign exchange daily turnover by player group



Despite some restrictions on speculative players which has caused reductions in market turnover, the foreign exchange market is still thriving. The daily turnover of interbank and customer transactions in the spot and forward markets averages around US\$ 1 billion, which is quite substantial compared to other financial markets. Figure 4 shows that the swap market remains the most active market in terms of average daily turnover, but after the September 2003 measure, its share of the market has fallen back to the pre-float level. It is worth noting that forward transactions currently make up around 8% of total market turnover, compared to 5% in the pre-float period. This is seen as a good sign that Thai corporates are more aware of the exchange risk they take and thus hedge accordingly. This implies that our intervention does not result in public perception that the central Bank will maintain any particular level of the exchange rate. In addition, narrow bid-offer spreads and stable margin levels reflect better market conditions in terms of liquidity and efficiency. The market is poised to grow even further as new products, especially hedging instruments, are being developed.

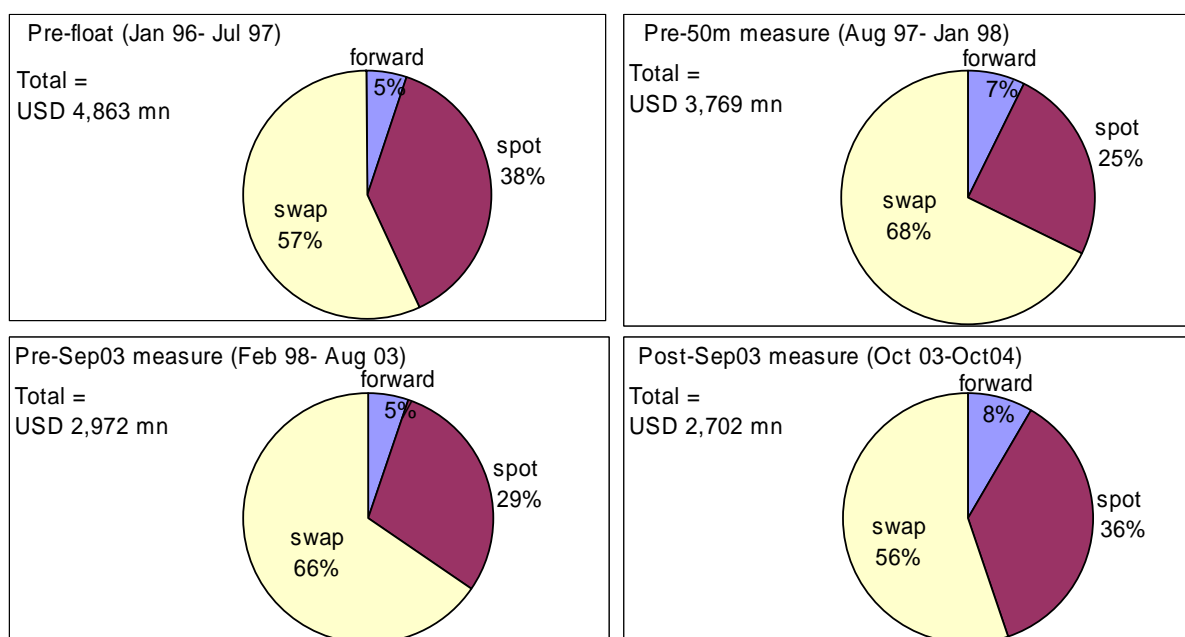
III. Institutional setup (relationships with government)

On the policy level, the Government decides on the foreign exchange regime, while the Bank has the responsibility to manage the exchange rate under that regime. Also, the Bank manages the official foreign exchange reserves. The Bank therefore is responsible for all costs/benefits of intervention and other related operations and it is obliged to remit its annual net profits to the government.²

² In accordance with The Bank of Thailand Act, BE 2485 and the Currency Act, BE 2501, the bank keeps two separate accounts: one for the banking department (the general account) and the other for the issue department (the currency

Figure 4

Foreign exchange daily turnover by transaction type



IV. Why do we intervene?

For a small economy that is very open to trade and capital flows like Thailand, movements in exchange rates causing changes in the value of the trade-weighted effective exchange rate, both nominal and real, can have a significant impact on the economy, particularly on inflation and GDP outcomes.

Moreover, exchange rates can overshoot. In this case, intervention may help in limiting the extent of overshooting, thus avoiding the disruptive impact and the need for costly real economic adjustment. Besides, it would enable the private sector to gradually adjust to the changing environment more efficiently. It is important, therefore, for the Bank to take these into account and intervene if conditions warrant.

As such, the bank largely intervenes to contain excessive volatility of the exchange rates. There are no specific target levels for the exchange rate. Intervention is aimed to smooth out and prevent excessive and persistent exchange rate volatility and disorderly movements, but not to resist changes in the exchange rate which are in line with broader economic fundamentals. If pressure on exchange rates reflects fundamental economic forces then it would be accommodated.

It is worth emphasising here that in implementing foreign exchange policy, the bank's primary concern is large and persistent departures of the exchange rate from its fundamental values, rather than short-term fluctuations. It is very crucial to identify factors that move the exchange rate from its fundamental values. In practice, we employ several indicators to help us distinguish desirable changes in the exchange rate from undesirable, excessive and destabilising changes. Specifically, both the bilateral rate of the Thai baht against the US dollar and the effective exchange rates are carefully monitored. The bank also monitors market activities, strategic positions, bid-ask spreads, composition and

reserve). The bank is required to remit 75% of its annual net profit in the general account to the government. The other 25% of the annual net profit is accumulated in the general account's "ordinary reserve". In addition, since 2002, the bank is also required to remit 100% of annual net profit from the currency reserve account to the government to pay off the principal on the bonds issued in accordance with the emergency decree empowering the Ministry of Finance to borrow and administer the borrowing to assist the Financial Institutions Development Fund Stage Two, BE 2545.

magnitude of foreign exchange turnover, option-implied volatility and short-term exchange rate volatilities, as shorter-term exchange rate fluctuations could be used as an early warning indicator to help signal circumstances where there might be misalignment or destabilising market activities.

Moreover, it is believed that some degree of volatility is healthy and conducive to the development of a liquid foreign exchange market. As it is essential to provide a sense of two-way risk to the market, the bank has been very careful not to dampen the volatility by too much and interfere with the development of the market. This consideration is taken into account when formulating intervention strategy so that it provides the right incentives for the market to develop the ability to cope with changing circumstances or various shocks and does not undermine risk management systems in the private sector.

For a while, immediately after the 1997 crisis, accumulating foreign exchange reserves was another important consideration for exchange rate management. A strong stock of reserves helps to minimise external vulnerability and increase confidence in the economy, especially among foreign investors. Greater confidence regarding the economy, in turn, promotes a sound and stable currency. Indeed, with international reserves amounting to US\$ 46 billion at the end of October 2004, Thailand's external position is sound and the baht has been more resilient in the face of external shocks. On the one hand, a high level of reserves certainly helps to support a stable currency, but on the other hand, it incurs sterilisation costs or costs associated with fluctuations of short-term interest rates. However, it is ultimately of secondary importance to exchange rate stability itself. In all this however, it is the maintenance of the inflation target that is the overriding objective of monetary policy.

V. How do we carry out our foreign exchange policy?

It is important that our foreign exchange policy and operations are consistent with the inflation targets. The inflation targeting framework does bestow a considerable degree of flexibility upon monetary policy, allowing the Bank to vary the balance between growth and inflation, as well as internal and external balance, so long as inflation is within the target range. The Monetary Policy Committee (MPC) takes into account movements in exchange rates, among other things, when formulating the policy stance, but changes to that stance are signalled and communicated solely through the policy rate: the 14-day repurchase rate.

A broad guideline on foreign exchange operations is set by the bank's market management sub-committee. The committee meets on a weekly basis to keep up to date with latest developments in the financial markets. Foreign exchange intervention techniques and tactics are formally evaluated (by the risk management group³) and revised quarterly or if necessary. Effectiveness of intervention is also studied regularly.

In carrying out our foreign exchange policy, we monitor the markets and intervene when deemed appropriate. Prudential exchange measures and regulations are also put in place to help stabilise the market.

➤ Monitoring exchange rate developments

To monitor foreign exchange rate movements, the nominal effective exchange rate (NEER) and the real effective exchange rate (REER) are both used as important pieces of information to make sure that our medium and long-term competitiveness, compared to the rest of the world, are in check.

³ The evaluation exercise is conducted approximately every quarter and typically involves a quantitative analysis performed by the risk management group to assess on how the FX intervention-related operations/regulations impact subsequent exchange rate movements. To do this, a statistical comparison based on hypergeometric distribution is used for testing. A significant result implies that the number of effective interventions is significantly different from the number of periods in which the market corrects itself, ie periods when the exchange rate naturally changes without any intervention. Based on this quantitative analysis, direct intervention of an appropriate size in the spot market has consistently been shown to significantly counteract the destabilising/excessive flows in the short term.

Moreover, certain qualitative indicators are also monitored so as to analyse what causes excessive movements or market instability, whether they stem from speculative flows or real trade and investment flows. These include, for example, flows of non-resident funds into all financial markets, flows of large exporters/importers, liquidity conditions in the offshore swap market, the options market and option-implied volatility, market long/short and strategic positions, significant technical or stop-loss levels, bid-offer spreads, etc. In addition, through our reporting requirements, we are able to observe volume, aggregate order flow in the markets, and other relevant foreign exchange positions of financial intermediaries.

➤ **Intervention**

The Bank employs both verbal intervention and actual intervention. The Bank intervenes in the foreign exchange market mainly via outright spot transactions by buying/selling Thai baht against US dollar, the currency most widely traded. Foreign exchange swap transactions are sometimes used in conjunction with outright intervention to influence liquidity conditions in the offshore market in order to make it more costly to fund speculative positions.

Intervention has taken place in the spot market with both onshore and offshore counterparties when necessary to maintain stability in the market. We intervene via agent banks or by dealing directly with banks depending on whether it is deemed necessary to make our presence known in that particular intervention. In general, we intervene discreetly in order to retain an element of surprise as our confirmed presence in the market could exacerbate the pressures on the currency. However, in some cases, visibility is quite helpful in that it changes market dynamics in such a way that it deters some traders and speculators from entering the market.

➤ **Sterilisation**

Intervention and sterilisation are necessary policy tools under the inflation targeting framework with a managed-float exchange rate system. The bank is committed to the inflation targeting framework in which the 14-day repurchase rate is used as the operating target. Therefore, sterilisation is part of the appropriate management of liquidity in the money market.

The bank conducts daily open market operations to equilibrate banks' reserves supply and demand in order to maintain the policy rate. A daily liquidity forecast gives guidelines for the amount of injection/withdrawal needed, taking into accounts exogenous factors such as changes in currency in circulation and government expenditures and receipts, as well as the other operations of the bank, including foreign exchange operations. In general, a combination of monetary instruments, namely repos, BoT bond issuance and foreign exchange swaps is used for sterilising the foreign exchange intervention.

We are aware of the cost/benefit that has arisen from sterilised intervention. In practice, however, this analysis is complicated by the fact that while the monetary costs to sterilisation (mostly in the form of foregone revenue and increased central bank balance sheet exposure) are possible to approximate, the benefits of less volatility in the exchange rates are not easily quantifiable. The BoT regularly estimates and monitors the monetary cost of sterilisation. However, the nature and extent of foreign exchange intervention are not greatly affected by it since the management of the exchange rate is first and foremost linked to reducing excessive volatility with the resulting benefits to the country's international trade, as well as to external and internal economic stability.

➤ **Other foreign exchange measures**

To help safeguard against potential instability and speculative activities in the currency market, the Bank imposed a few measures on certain types of foreign exchange transactions as follows.

- **29 January 1998:** non-residents without any underlying trade or investment activities in Thailand were allowed to obtain Thai baht credit facilities from their onshore counterparties up to a combined outstanding amount of THB 50 million per entity.
- **23 July 2003:** to promote capital outflows, some exchange regulations were relaxed, eg allowing institutional investors to invest more abroad and allowing Thai residents to issue structured products which link returns to foreign variables such as foreign exchange rates

and foreign assets. As a result, demand for investment in foreign debt securities rose markedly. On 20 August 2003 the Bank approved the total investment of US\$ 2,449.26 million.

To deter short-term speculative capital inflows, the following two measures were imposed.

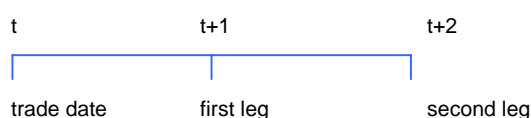
- **11 September 2003:** the amount of Thai baht that onshore financial institutions could borrow short-term (less than 3 months) from a non-resident without underlying trade or investment was limited to no more than THB 50 million per entity. However, transactions with underlying trade or investment were allowed without restrictions. This regulation resulted in baht-bullish non-residents shifting their investment from short-term Tom/Next swaps⁴ into those of 3-month and 6-month tenors. The daily average volume of Tom/Next transactions fell from US\$ 1,500 million to US\$ 120 million after the imposition of this measure. Nevertheless, some non-residents attempted to exploit the loopholes in the 11 September measure by parking their baht liquidity in Non-Resident Baht Accounts (NRBA) instead. As a consequence, the total outstanding of all NRBA's rocketed, reaching a peak of THB 63,000 million in mid October 2003 from the normal level of around THB 18,000 million.
- **14 October 2003:** In light of findings that non-residents were using NRBA's to speculate on Thai baht instead of facilitating payments resulting from trades and investments in Thailand, the Bank issued a circular requesting onshore financial institutions to limit the outstanding balance of NRBA's at the close of the business day to no more than THB 300 million for each non-resident. This limit includes all NRBA's belonging to such a non-resident at all financial institutions in Thailand unless they have been exempted by the Bank of Thailand on a case by case basis. In addition, onshore financial institutions are prohibited from paying interest on current and saving NRBA's. The outstanding amount in the NRBA's was thus decreased substantially to around THB 16,000 million on the 16 October and has since stayed around THB 15,000-20,000 million.

VI. Information disclosure

Data on foreign exchange reserves outstanding and forward obligations are published weekly in conformation with the SDDS reporting system. However, like some other central banks' practice, data on foreign exchange market intervention are not published. One of our main reasons for not disclosing intervention data stems from the fact that our domestic foreign exchange market is still relatively small and not liquid or deep enough. Releasing intervention-related data at an inappropriate time could do more harm than good to the Thai economy, apart from the destabilising effect that could limit the effectiveness of the intervention. However, once the market becomes more developed in terms of its depth and breadth, it will allow the bank to be more transparent regarding this matter.

⁴ NRs have extensively used the foreign exchange swap market to manage their short-term baht liquidity. The Thai baht/US dollar swaps are quite active up to one-year maturity, but are more typically undertaken for a term of just one day through the so called "Tom/Next" (short for Tomorrow/Next) transaction. The first leg of the Tom/Next swap transaction takes place the day after the trade date where one would initially sell (buy) baht in exchange for US dollars. The second leg (the forward leg), where one would buy (sell) the baht back at the predetermined exchange rate, takes place the day after the first leg.

Time line for Tom/Next swap transaction



Monetary and exchange rate policies in the post-crisis period in Turkey¹

Fatih Özatay²

1. Introduction

In mid-May 2001, just three months after the February crisis, Turkey started to implement a new programme. The banking sector was in turmoil, calling for immediate action. The rescue programme increased the public debt-to-GDP ratio sharply. Other main pillars of the May 2001 programme were macroeconomic discipline, rehabilitation of the banking sector, and an ambitious agenda for structural reforms.

In the two decades preceding the 2001 crisis, from the perspective of the likely impact of exchange rate developments on the economy, the Turkish economy had at least two important features: a high pass-through from the rate of depreciation of the Turkish lira to the inflation rate and high dollarisation and the associated currency mismatches. Although these features are generally seen as two of the root causes of fear of floating, the Turkish stabilisation and structural adjustment programme of the post-crisis period put a floating exchange rate regime at center stage.

The Central Bank of Turkey (CBRT) stated at the outset of the programme that the number of interventions would be strictly limited. Besides strictly limited volatility interventions, based mainly on the fact that forthcoming debt repayments could significantly reduce foreign exchange reserves, the CBRT announced at the beginning of 2002 that it was going to hold foreign exchange purchase auctions in case of favourable balance of payments developments and reverse dollarisation. The principle was that those auctions should be rule based and transparent, and purchase amounts were to be announced at the beginning of each month.

This paper aims at providing information on the Turkish monetary and foreign exchange rate policies in the post-crisis period. A special emphasis is given to the motives behind interventions and foreign exchange purchase auctions. Techniques and implications of interventions and auctions are also discussed. The plan of the paper is as follows. The second section provides brief information regarding the evolution of the Turkish economy after the crisis and to what extent dollarisation and pass-through are important. We discuss the monetary and exchange rate policies of the CBRT in the third section. This section also provides information on the interventions and auctions of the post-crisis period. In the last section we briefly analyse the implications of interventions and auctions and discuss their effectiveness.

2. Dollarisation and exchange rate pass-through in the post-crisis period

The main pillars of the May 2001 programme were macroeconomic discipline, rehabilitation of the banking sector, and an ambitious agenda for structural reforms. The programme, which was strongly supported by IMF and World Bank credits, put a floating exchange rate regime at center stage. Starting from late 2001, the programme showed its strength: inflation expectations followed a downward trend, inflation rates have almost continuously declined, the public debt-to-GDP ratio was significantly reduced, while the Turkish economy started first to recover and then to show high growth rates (Table 1).

¹ Paper prepared for the BIS Deputy Governors' Meeting on 2-3 December 2004, Basel.

² Deputy Governor, The Central Bank of Turkey. Fatih.Ozatay@tcmb.gov.tr.

Table 1

Selected macroeconomic indicators: 2001.03 - 2004.12 (%)

	Growth rate ^a	Expected inflation ^b	Expected inflation ^c	Wholesale inflation	Consumer inflation	Public debt stock/GDP	Interest rate ^d
2001.03	-1.0	55.0	na	35.1	37.5	72.1	193.7
2001.06	-9.8	63.3	na	61.8	56.1	98.2	88.4
2001.09	-7.5	69.8	64.8	74.7	61.8	105.1	87.6
2001.12	-10.3	72.7	69.8	88.6	68.5	99.7	74.1
2002.03	2.3	52.6	43.6	77.5	65.1	91.1	68.4
2002.06	8.9	45.4	35.2	46.8	42.6	95.0	72.2
2002.09	8.0	42.0	34.3	40.9	37.0	92.2	62.2
2002.12	11.7	35.0	31.0	30.8	29.7	87.4	49.8
2003.03	8.1	35.5	27.3	35.2	29.4	87.6	59.9
2003.06	3.9	29.3	25.4	29.6	29.8	81.7	46.0
2003.09	5.5	24.4	20.5	19.1	23.0	76.3	32.2
2003.12	6.1	19.3	19.1	13.9	18.4	78.6	27.9
2004.03	10.1	13.4	11.8	8.0	11.8	77.1	24.4
2004.06	13.4	12.9	11.5	10.5	8.9	78.5	27.5
2004.09	4.5	11.9	10.5	12.5	9.0	77.5	25.4
2004.12		12.1	10.0	13.8	9.3		23.1

^a Annual rate of changes.

^b Business survey of the central bank, expected year-end wholesale price inflation.

^c Expectations survey of the central bank, expected year-end consumer price inflation.

^d Average compounded interest rates realised in Treasury auctions, weighted by net sales.

Source: Central Bank, SIS, Treasury.

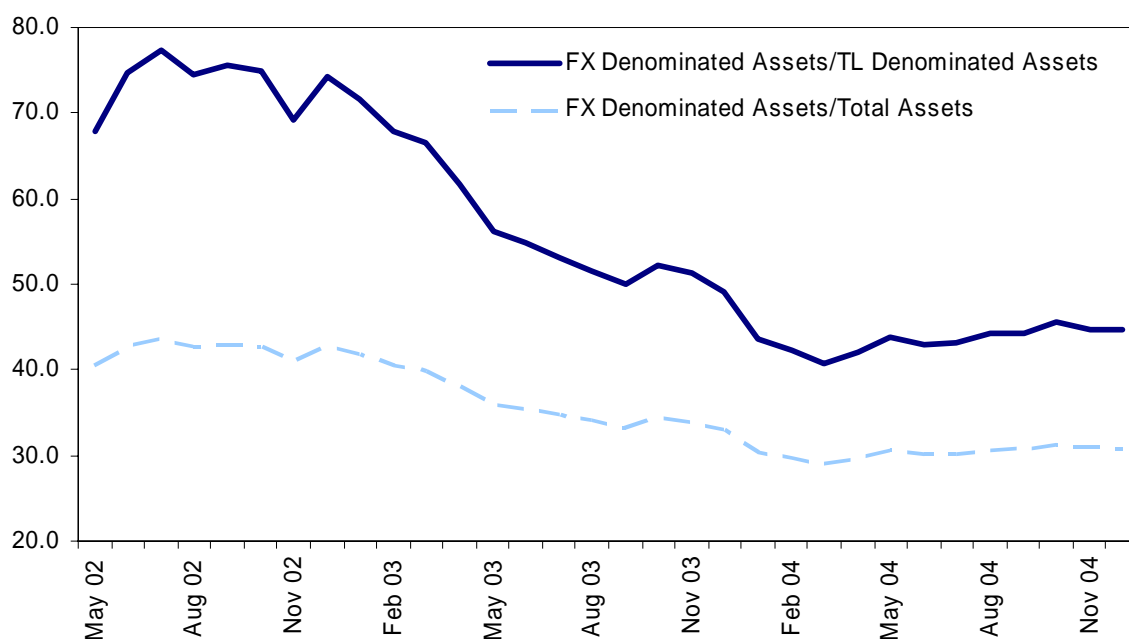
2.1 Dollarisation

It is seen from Table 1 that a sharp reduction in the inflation rate occurred simultaneously with a rapid growth rate. Moreover, throughout the post-crisis period, primary budget surplus to GNP ratios were rather high (5.5% in 2001, 4.1% in 2002, 6.3% in 2003, and 6.5% in 2004). Despite this extremely tight fiscal policy, Turkey succeeded in achieving high growth rates. No doubt, this phenomenon is not unique to Turkey; it was observed in some other countries in the 1980s, leading to the development of so-called expansionary fiscal contractions in economic literature. The important point to note from the perspective of this paper is that in heavily indebted countries fiscal discipline, by diminishing concerns about debt sustainability, reduces default premium and real interest rates. In such an environment, consumer and business confidence also start to increase. Hence, confidence build-up on the one hand and a reduction in real rates on the other boost private demand, which may more than offset the contractionary impact of fiscal discipline on aggregate demand.

But under such conditions, exactly due to the same reasons, it is natural to expect first a reduction in new demand for foreign exchange denominated assets relative to domestic currency denominated assets (flow effect) and then a reduction in the existing stock of foreign currency denominated assets (stock effect). This process can be termed as reverse dollarisation and has important implications for foreign exchange rate policy. Here it is important to note that a failure to observe a reduction in the stock of foreign exchange-denominated assets does not necessarily mean that dollarisation should continue. On the contrary, due to "flow reverse dollarisation", the share of foreign exchange

denominated assets in total assets could have started to decline. Leaving discussion of the implications of reverse dollarisation for exchange rate policy to the following section, we provide evidence for reverse dollarisation in Figure 1. In the figure, we can see the evolution of foreign exchange denominated assets to Turkish lira (TRL) denominated assets and total assets for the May 2002-December 2004 period. A significant decline in these ratios, especially starting from 2003, and up to mid-2004, is immediately evident.

Figure 1
Portfolio preferences of non-banking sector: 2002.4 - 2004.12 (%)



However, one should also note that there can be temporary deviations from this (expected) reverse dollarisation trend. The main reason is that while sound policies and reforms are necessary for improving economic performance, considerable time is needed for reducing the vulnerability of an economy that accumulated problems over the years to changes in international risk factors and other types of shocks (domestic or international). As evident from Figure 1, the reverse dollarisation process stopped in April 2004 when concerns about a continued rise in US interest rates became widespread and uncertainties surrounding the EU accession process for Turkey started to increase. Such temporary deviations from the main trend of reverse dollarisation also have repercussions for exchange rate policy, as discussed in the third section.

2.2 Pass-through effect

In an open economy, the domestic level of prices is affected by international prices and changes in exchange rates through the prices of tradable goods and services. In highly dollarised economies, in addition to such cost effects, changes in exchange rates also affect prices through balance sheet effects and expectations. The effect of changes in exchange rates on domestic inflation is called the pass-through effect. It is natural to expect both a decline and a slowdown in this effect, due to the radical change in macroeconomic policies, i.e. implementation of prudent macroeconomic policies after the 2001 crises and floating exchange rate regime. In such an environment, the exchange rate begins to lose its function as a nominal anchor. This is first reflected in firms' pricing decisions, leading to a decline in the pass-through effect and supporting the fall in inflation. As disinflation gains pace, expected inflation strengthens as a nominal anchor.

However, such a change in the pass-through effect can take time and furthermore before a decline occurs (a decrease in the sum of simultaneous and lagged effects of exchange rate changes on inflation) in this effect one can only observe a slowdown (less contemporaneous but more lagged

effects, whereas the cumulative effect does not change significantly). Table 2 reports cross-correlation coefficients between the k-period lagged rate of change of the exchange rate and inflation for different periods. In the period preceding the crisis, the pass-through effect is high and almost without delay, whereas in the post-crisis period there is a considerable slow-down in this effect as reflected by the highest correlation coefficients at lagged values of exchange rate changes. No doubt, one should not rely on simple correlations only. Further evidence is obtained by recursively regressing CPI inflation on contemporaneous and lagged values of rates of change of the exchange rate (four lags) and the one-month lagged output gap. Figure 2 shows the evolution of the sum of the coefficients of exchange rate change variables for the January 1996-September 2004 period. A significant decline in the pass-through effect can easily be seen. It can also be seen that the decline in the pass-through effect, which was more rapid until the beginning of 2002, showed a relative slowdown thereafter.³

Table 2

Cross-correlation coefficients between k-period lagged values of the rate of change of the exchange rate and the current value of the inflation rate

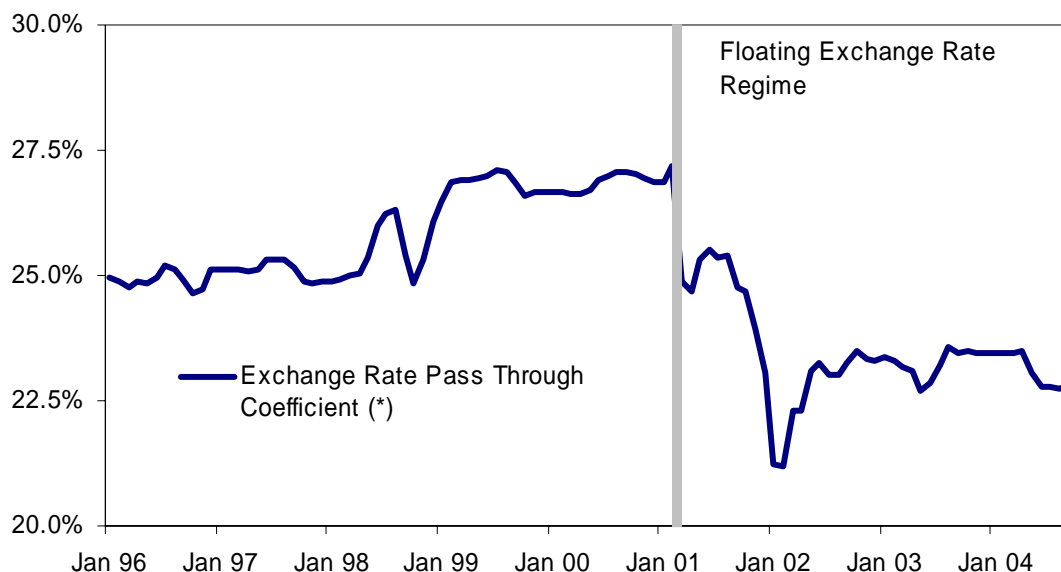
(k) period lagged exchange rate change	1987:01 - 2000:12		2002:01 - 2004:09	
	Monthly change	3-monthly change	Monthly change	3-monthly change
0	0.60	0.59	-0.18	-0.25
1	0.31	0.52	0.09	-0.01
2	0.06	0.27	0.23	0.20
3	-0.04	0.00	0.22	0.34
4	-0.13	-0.07	0.25	0.37
5	0.02	0.01	0.16	0.32

Note: Nominal exchange rate TRL vis-a-vis US is used for computations.

³ According to a recent study carried out by the research department of the CBRT, which uses a time-varying parameter model in a Kalman filter setup, the time-varying pass-through coefficients are still declining, although at a slower pace compared to the beginning of the floating exchange rate regime.

Figure 2

The pass-through effect: January 1996-September 2004



Note: (*) 1) The pass-through is the sum of the exchange rate coefficients obtained from the regression which explains monthly inflation, by four lagged series of change in the exchange rate, lagged monthly inflation and output gap. 2) For estimating output gap figures, projections have been used for 2004Q3-Q4.

3. Monetary and exchange rate policies in the post-crisis period

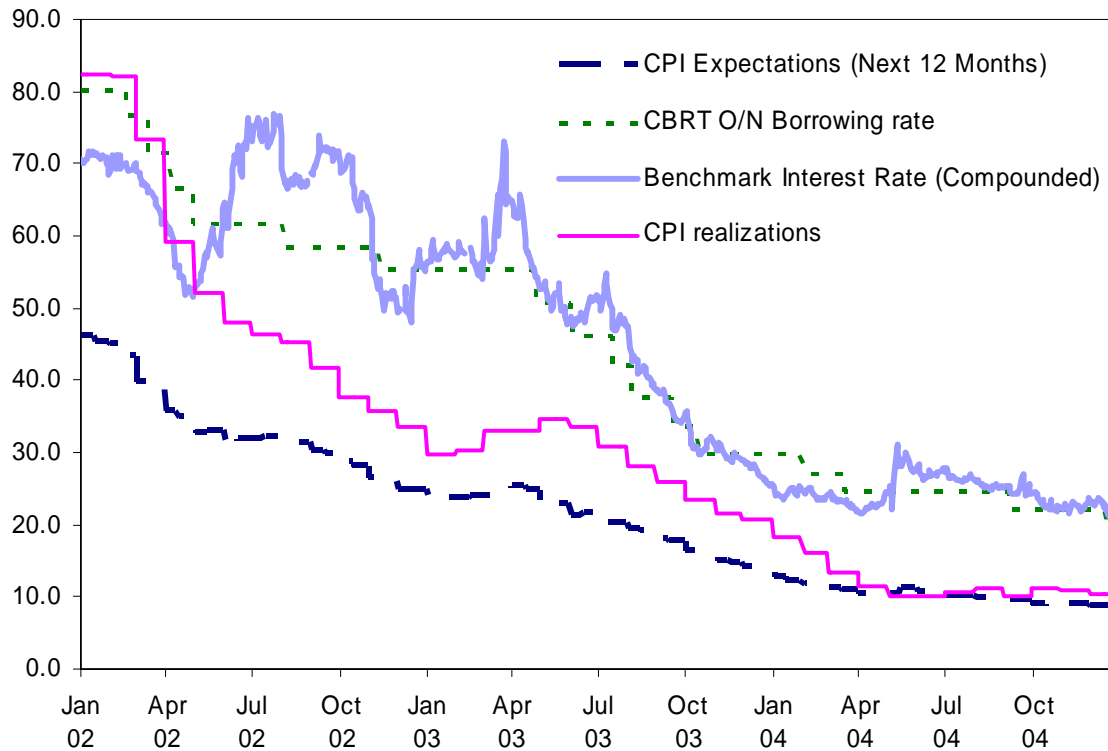
3.1 Monetary policy

At the beginning of 2002, the CBRT announced that it was going to implement implicit inflation targeting, which is still the current monetary policy framework. The core of formal inflation targeting is included in this framework. That is, firstly, given that the main aim of the CBRT is to achieve price stability, short-term interest rates (the main policy tool of the CBRT) have been changed based on the inflation outlook only. Secondly, whenever a decision was taken on interest rates, the rationale behind that decision was explained to the public by press releases. However, some elements of formal inflation targeting were missing: for example, the public did not know the meeting dates of the monetary policy committee.⁴ With continued fiscal discipline and structural reforms in the background, implicit inflation targeting has been successful in sharply reducing the inflation rate (Table 1). Figure 3 shows the evolution of secondary market interest rate, policy-rate of the CBRT, inflation expectations that are obtained from surveys, and consumer inflation in the post-crisis period. High and positive correlation between the inflation rate, inflation expectations, secondary market interest rate, and the CBRT policy rate are immediately observable.

⁴ On the 20th of December 2004, the CBRT issued a press release: Accordingly, starting from January 2005, the monetary policy committee would meet on the 8th of each month and interest rate decisions would be announced on the following business day at 09:00hrs. It was also announced that the CBRT would start the implementation of formal inflation targeting in the beginning of 2006.

Figure 3

Evolution of inflation expectations and interest rates



3.2 Exchange rate policy

The pre-announced fixed rate of increase of the exchange rate system, which had been implemented since January 2000, collapsed in February 2001. One of the most important elements of the programme to have been implemented after the crisis is the floating exchange rate system. Both the monetary and exchange rate policies of the CBRT were made more explicit at the beginning of 2002. At that time, CBRT once more emphasised the importance of floating exchange rate system. The main principle since then has been that market conditions would determine exchange rates. That is, the CBRT stressed that it would not interfere in the level or trend of exchange rate. It also announced that it could intervene in case of excess volatility. Based on the main principle, however, the CBRT has also pledged to keep the number of such volatility interventions strictly limited. Table 3 provides information regarding the number of volatility interventions, their type (sale or purchase), and the amount purchased or sold in millions of US dollars.

Table 3
Volatility interventions (2002-04)

Date	Type of intervention	Amount (million US\$)
11.07.2002	Sale	3
02.12.2002	Purchase	16
24.12.2002	Sale	9
2002 net purchase		4
12.05.2003	Purchase	62
21.05.2003	Purchase	517
09.06.2003	Purchase	566
18.07.2003	Purchase	938
10.09.2003	Purchase	704
25.09.2003	Purchase	1442
2003 net purchase		4229
16.02.2004	Purchase	1283
11.05.2004	Sale	9
2004 net purchase		1274

In addition, at the beginning of 2002, the CBRT explicitly told the markets that:

- i Conditional on strict implementation of the programme and in the absence of large external shocks, the dollarisation process would lose its importance, becoming eventually a reverse dollarisation process.
- ii It was most likely that favourable balance of payments conditions would be observed.
- iii Although the exchange rate regime was a float - almost pure float - the level of foreign exchange reserves was at least as important for three reasons. First, Turkey had debt repayments forthcoming to the IMF. Second, international investors gave a special emphasis to the level of reserves. Third, CBRT wanted to clear its balance sheet of some types of foreign exchange liabilities, such as deposits of workers abroad.
- iv Given the importance of the level of reserves (in this case regardless of the exchange rate system), provided that at least one of the conditions stated in the first two paragraphs materialised, it was going to buildup reserves through rule based, transparent, and pre-announced purchase auctions.

Table 4 presents data for foreign exchange purchase auctions. The important point to note is that these auctions, unlike volatility interventions, were not discretionary. They were rule-based, which was known by the public. Provided that the aforementioned conditions were satisfied, at the beginning of each month, the CBRT announced how much and via which mechanism it was going to buy foreign exchange in these daily auctions. At later stages the auction mechanism was revised: an optional selling system was also introduced. Finally, the CBRT revised the auction mechanism effective from 22 December 2004. A yearly programme was announced to minimise the distortionary effects of possible changes in daily purchase amounts at the beginning of each month on the operation of the foreign exchange market. It was made explicit that the CBRT was not going to change the programme unless extraordinary changes were observed in terms of foreign exchange liquidity.

Table 4
Foreign exchange purchase auctions: 2002-04
(million US\$)

Date	Amount	Date	Amount	Date	Amount
Jan-02		Jan-03		Jan-04	285.8
Feb-02		Feb-03		Feb-04	805.1
Mar-02		Mar-03		Mar-04	1,417.9
Apr-02	280.0	Apr-03		Apr-04	1,353.6
May-02	242.0	May-03	340.0	May-04	
Jun-02	273.0	Jun-03	630.0	Jun-04	
Jul-02		Jul-03	990.0	Jul-04	
Aug-02		Aug-03	1,050.0	Aug-04	
Sep-02		Sep-03	1,316.7	Sep-04	
Oct-02		Oct-03	1,325.6	Oct-04	
Nov-02		Nov-03		Nov-04	
Dec-02		Dec-03		Dec-04	241,6

4. Effectiveness of foreign exchange interventions

Since foreign exchange purchase auctions were pre-announced at the beginning of each month and the amounts that were going to be purchased were declared at the outset, we do not classify these auctions as interventions. Given that the only aim was to buildup reserves, one should simply look at the level of reserves to judge the success of these purchase auctions. As evident from Table 4, the CBRT purchased US\$ 10.3 billion in the 2002-04 period through such auctions. To put it another way, in that period, foreign exchange purchase auctions helped to increase CBRT reserves by 55% on average.

Akıncı, Emir, Özlale, and Şahinbeyoğlu (2004) analyse the causes and effectiveness of foreign exchange interventions for the post-crisis period. They make use of three different methodologies: event study, E-GARCH models, and time-varying parameter models. They do not find any significant impact of volatility interventions on the volatility of the exchange rate in the May 2001-December 2003 period. Guimaraes and Karacadag (2004) note that interventions did not affect the level of the exchange rate but reduced its volatility in the period March 2001-October 2003. Note that they do not differentiate between volatility interventions and purchase auctions and use an aggregated data set.

5. Reserve management

In Turkey, the reserves are held and managed independently by the CBRT. Reserve management strategy is influenced by different factors. One factor is the liability structure of the CBRT, which is somewhat different from most central banks. The CBRT carries a relatively large amount of liabilities in foreign exchange in the form of savings deposits held by Turkish citizens living abroad. An important part of required reserves is in foreign exchange.

Secondly, foreign debt payments executed on behalf of the Turkish Treasury also have an influence on reserve management strategy, and it should be noted as well that under the current institutional framework, asset and liability management functions rest with different institutions. While the Treasury manages the government's foreign debt, the CBRT is responsible for the management of foreign

reserves, which renders sovereign risk management a challenging task. The CBRT takes expected foreign debt payments of forthcoming years into account when designing the global benchmark.

The model portfolio is designed to minimise credit, market and liquidity risks incurred in international markets. The portfolios in major reserve currencies are divided into sub-groups, each providing liquidity in different time horizons. While the operational portfolio meets day-to-day liquidity needs, the liquidity portfolio provides liquidity in the short to medium terms. Although relatively small, the investment portfolio is managed with the objective of ensuring return maximisation, while staying within the overall risk limits. The bulk of the reserves are invested in AAA rated highly liquid government issues, whereas a small portion of the reserves is placed with at least Aa2 rated banks in the form of time deposits.

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Foreign exchange intervention in Venezuela

Iván Giner and Omar Mendoza

Introduction¹

In the last eight years, different exchange rate regimes have been applied in Venezuela: crawling band (1996-2001), free floating (2002) and, since January 2003, capital controls with a fixed exchange rate. After the disruption of oil activity in December 2002, capital controls were implemented to prevent the depletion of international reserves. Under the current system, an administrative office (*Comisión de Administración de Divisas*: CADIVI) is in charge of regulating and managing the use of foreign currency. The Central Bank of Venezuela (BCV) fixes a monthly allocation of foreign currency to be administered by CADIVI, purchases foreign currency from residents, and sells foreign currency to the public and private sectors subject to approval from CADIVI. Thus, there is not much scope for central bank interventions in the foreign exchange market in Venezuela with the current regime. However, we might refer to the intervention mechanisms that were applied during the currency band and the floating regimes that preceded capital controls. In this context, this note is organised as follows: Section 1 mentions the rationale of central bank intervention in the forex market; Section 2 refers briefly to the experience during the currency band system; Section 3 focuses on the intervention during the float, and Section 4 presents some concluding remarks.

1. The rationale of central bank intervention in the forex market

Venezuelan law establishes that PDVSA, the state oil enterprise, must sell its oil export revenues to the central bank. These revenues constitute the main source of foreign currency in Venezuela. On the other hand, the private sector is characterised by demanding more foreign currency for imports than those generated by its export activities. These two particular facts make the BCV the main supplier of foreign currency in Venezuela and justify its regular participation in the market to satisfy the private sector's currency requirements, regardless of the exchange rate arrangement. We call this form of intervention *foreign currency provisions*.

In addition, during the last two exchange rate regimes - the band system (July 1996 - February 2002) and the dirty float regime (February 2002 - January 2003) - the BCV intervened to reduce the volatility of the nominal exchange rate. We call this kind of intervention simply *intervention*.

For monetary analysis, keep in mind that when the BCV buys foreign currency the counterpart in domestic currency is deposited in the accounts that PDVSA and the government maintain with the BCV. When the government and PDVSA withdraw bolivars from their accounts the money base increases. Then, the BCV might take into account the regular sales of foreign currencies as an additional element that reduces any excess of money base.

2. Interventions during the band system

The exchange rate band regime was implemented as part of a set of new economic policies aimed at reestablishing macroeconomic stability. In particular, the exchange rate policy had the objective of reducing inflation expectations while providing some flexibility to the exchange market. The collapse of the currency band regime was preceded by an important increase in exchange market pressure, which

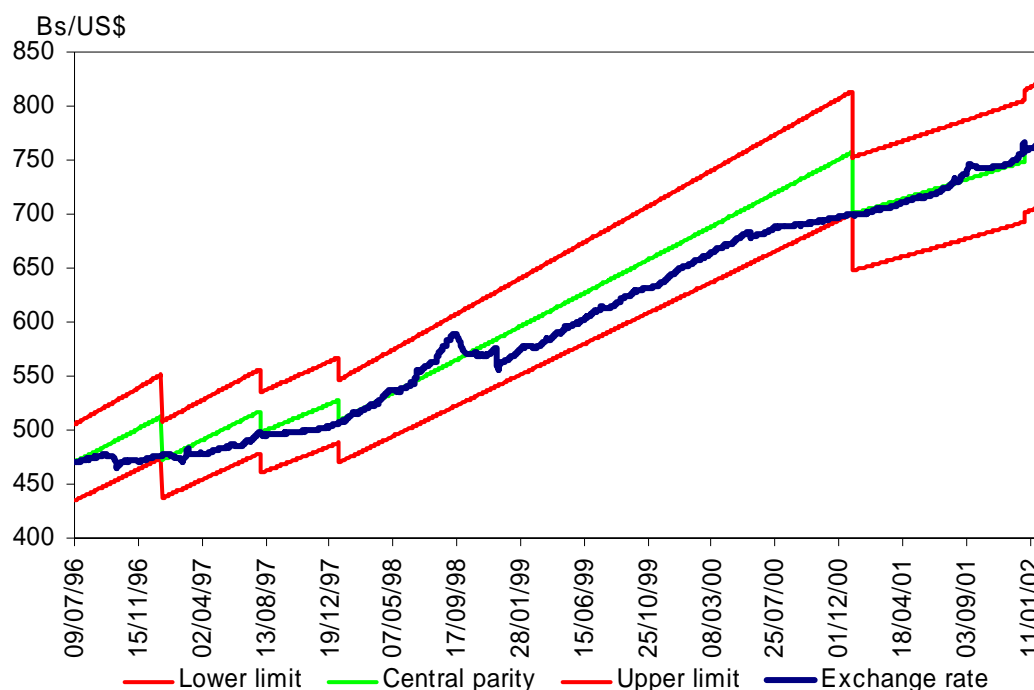
¹ The authors would like to thank Victor Olivo, Adriana Arreaza, and Luis Pedauga for their important comments and suggestions.

triggered significant capital outflows as the BCV tried to defend the exchange rate. As a result, international reserves experienced a significant reduction.

During the crawling band system, the BCV did not establish an explicit mechanism to separate interventions from *currency provisions* in the foreign exchange market. This policy was criticised since economic agents did not understand why the BCV intervened when the exchange rate was far from the boundaries of the bands. For most agents, given the behaviour of the exchange rate (see Figure 1), the BCV seemed to be targeting the path of the exchange rate, instead of allowing free movements of the exchange rate within the band.²

In addition to the sales and purchases of foreign currency, the BCV intervenes in the market by establishing rules on foreign transactions. For example, the BCV set limits to financial institutions' foreign currency positions, in order to diminish their exposure to the exchange rate risk. The BCV also established a foreign currency intermediation index to ensure that a minimum of sales of foreign currency by the BCV to commercial banks went to final non-financial clients.³

Figure 1
Exchange rate crawling band, 1996-2002



Source: BCV.

3. Intervention during the floating exchange rate system

A floating exchange regime was adopted to re-establish the external equilibrium, increase competitiveness and make more efficient monetary policy in terms of controlling inflation. Nevertheless, the float collapsed when oil exports virtually ceased in December 2002, which caused, in the middle of political turmoil, a speculative attack that led to a sharp depreciation of the bolivar.

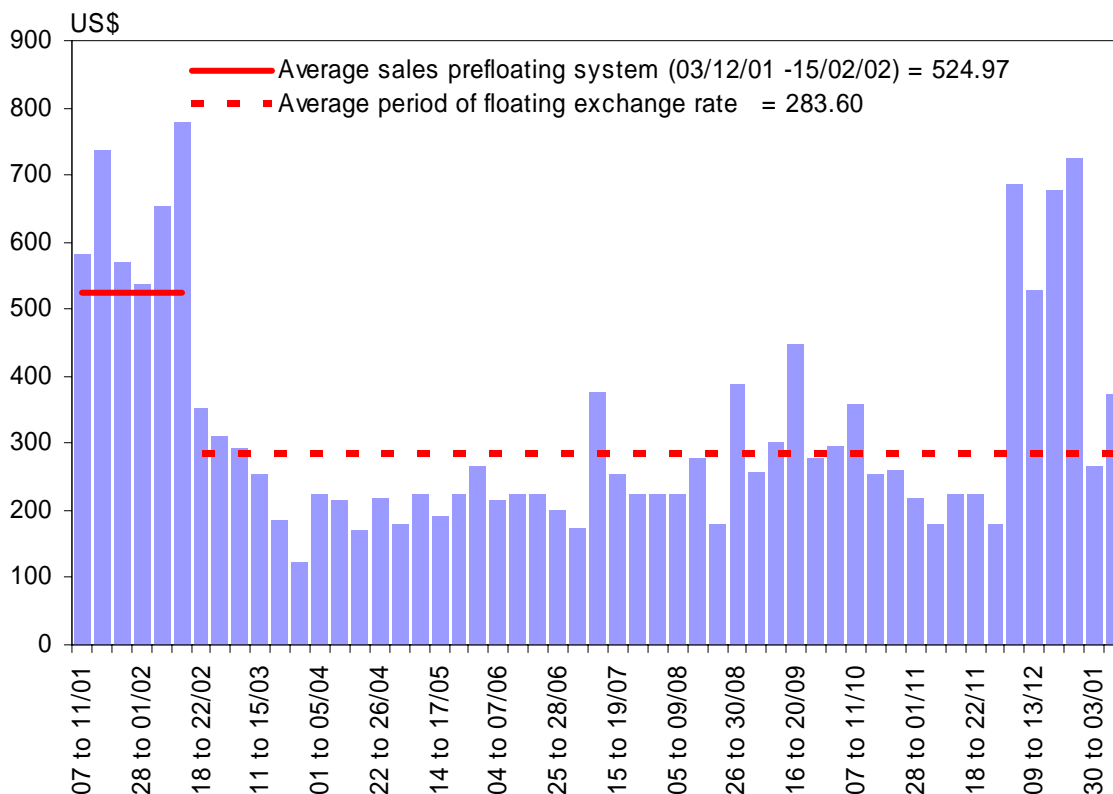
² For more details on exchange rate bands in Venezuela see, for instance, Guerra and Pineda (2000) and Nóbrega (2002).

³ For more information about these instruments see Belisario et al (2000).

During the float, the BCV designed a more transparent participation mechanism, which distinguished *currency provisions* from *interventions* to control the volatility of the exchange rate. In addition, the BCV maintained the restrictions on foreign transactions established in the previous regime: the limits to the foreign currency positions of financial institutions and the creation of a foreign currency intermediation index.

Figure 2

Weekly clear sales of foreign currency by the BCV, 2002-2003

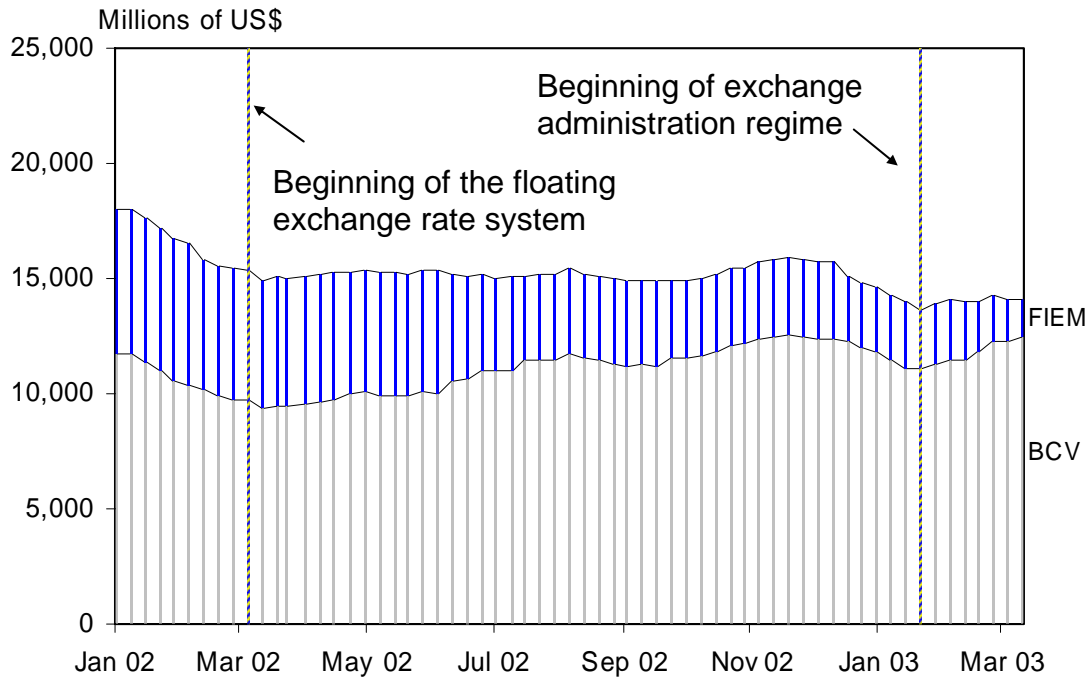


Source: BCV.

Under the floating exchange rate regime, currency sales by the BCV were significantly lower than those observed at the end of the band system (see Figure 2). By the end of 2002, net international reserves held by the central bank were US\$ 11,974 million, a higher amount than that at the beginning of the floating system (US\$ 11,192 million by the end of January 2002) (see Figure 3).

Figure 3

Total international reserves (BCV+FIEM), 2002-2003



Source: BCV.

Note: FIEM indicates Macroeconomic Stabilization Fund.

3.1 Foreign currency provisions

Foreign *currency provisions* consisted of allocating a daily amount of foreign currency previously established by the BCV. This amount was sold to the economic agents through authorised institutions (commercial banks and currency exchange houses) using three daily auctions. Each authorised institution could make up to five bids, including the price and amount to be purchased. The most competitive bids would win the auction. No operator could get more than 15% of the total. The market determined the exchange rate in each auction, and the BCV published the resulting maximum, minimum and average values.

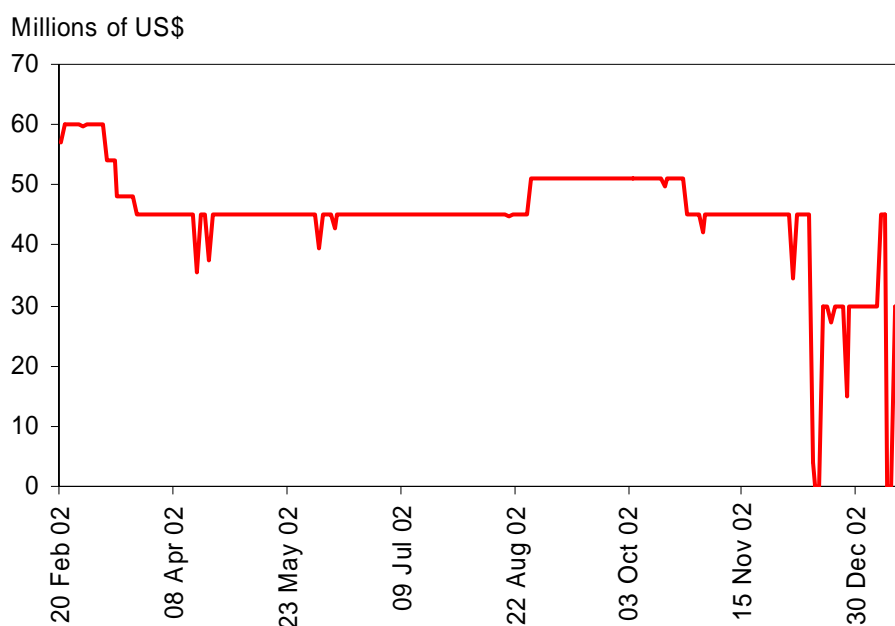
The amount to be auctioned was subject to periodic revision by the BCV, taking into account the forecasts of the net cash flows of foreign currency and the seasonal nature of imports.

At the beginning of the float, the BCV decided to auction US\$ 60 million daily; to cover the estimated value of daily commercial transactions abroad. From 6 to 18 March 2002, a reduction was implemented to US\$ 45 million. At the end of August, the participation was increased to US\$ 51 million to meet higher demand for foreign currency to cover transactions associated with the seasonal increase of imports during the fourth quarter. On 22 October, the amount was cut back to US\$ 45 million.

Until the beginning of December 2002 the auctions worked quite well. The disruption of the oil and financial activities introduced instability to the auction system, affecting the amount and the number of daily auctions. By January 2003, it was impossible to regular auctions and an end to the auctions was announced on 16 January.

Figure 4

Daily sales of foreign currencies through auctions during the floating exchange rate system



Source: BCV

3.2 Interventions to control for excess volatility

Under the float, the BCV had the power to intervene in the foreign exchange market to moderate excess volatility of the exchange rate. Policymakers were concerned with negative effects of exchange rate volatility on investment and international trade.⁴ Likewise, they argued that excess exchange rate volatility increased the pass-through. For the Venezuelan economy, Mendoza Lugo (2004) finds that in moments of high depreciation, a negative shock in the exchange rate has a significant pass-through. Specifically, negative shocks on the nominal depreciation rate of 1.8 and 5.3 percentage points produce pass-through of 30.6% and 49.3%, respectively, in a year. These results can be interpreted as evidence that intervention in the foreign exchange market might have significant effects in terms of reducing inflation when the depreciation rate experiences an important increase.

As opposed to the case of *foreign currency provisions*, interventions controlling exchange rate volatility were unannounced. Transactions related to this type of intervention were made through the BCV trading desk. The mechanism, including the parameters of a “normal exchange rate variation zone”, was approved by the board of directors.

This intervention rule differs from that used during the crawling band in two ways: (1) the central parity was determined by the evolution of the exchange rate (moving average) instead of being defined exogenously, taking into account an inflation objective; (2) the parameters of the variation zone were not announced, as opposed to those of the exchange rate band.

By the end of the floating period, intervention behaved very close to a full discretionary instrument. Once economic agents realised that the disruption in oil activity initiated in December 2002 could have medium and long-run consequences for the economy, exchange market pressures increased substantially and the BCV decided to have a permanent presence in the exchange market.

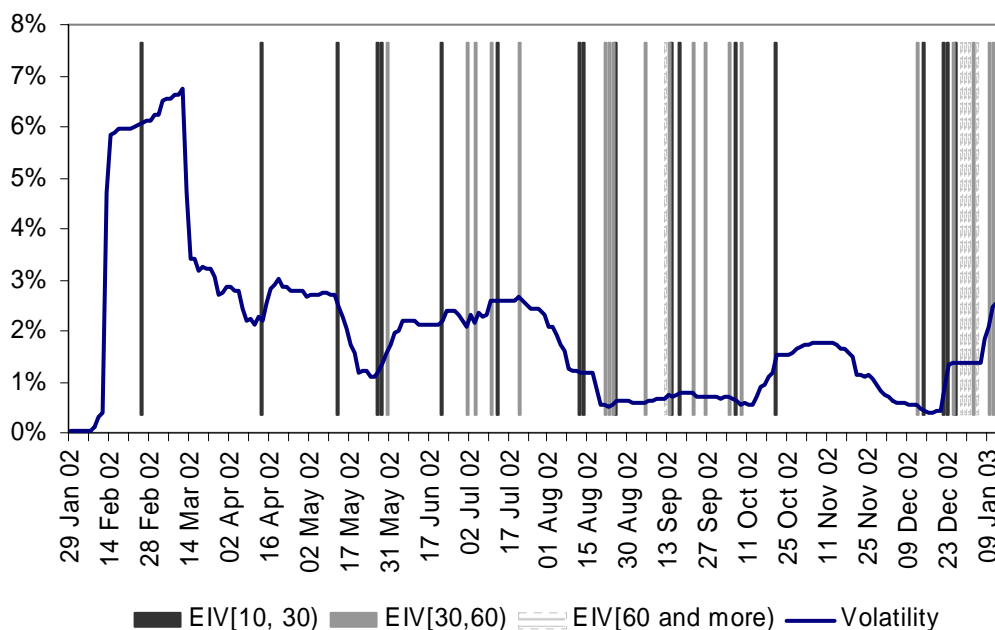
⁴ As proposed by Bonser-Neal (1996).

3.3 Effectiveness and implications of forex interventions

The interventions aimed at controlling excess volatility initially had some success. The effectiveness of the interventions, however, decreased as interventions became more frequent. By December 2003, interventions were practically ineffective; that is, exchange rate volatility increased in spite of the frequent interventions in the forex market (see Figures 5 and 6).

Figure 5

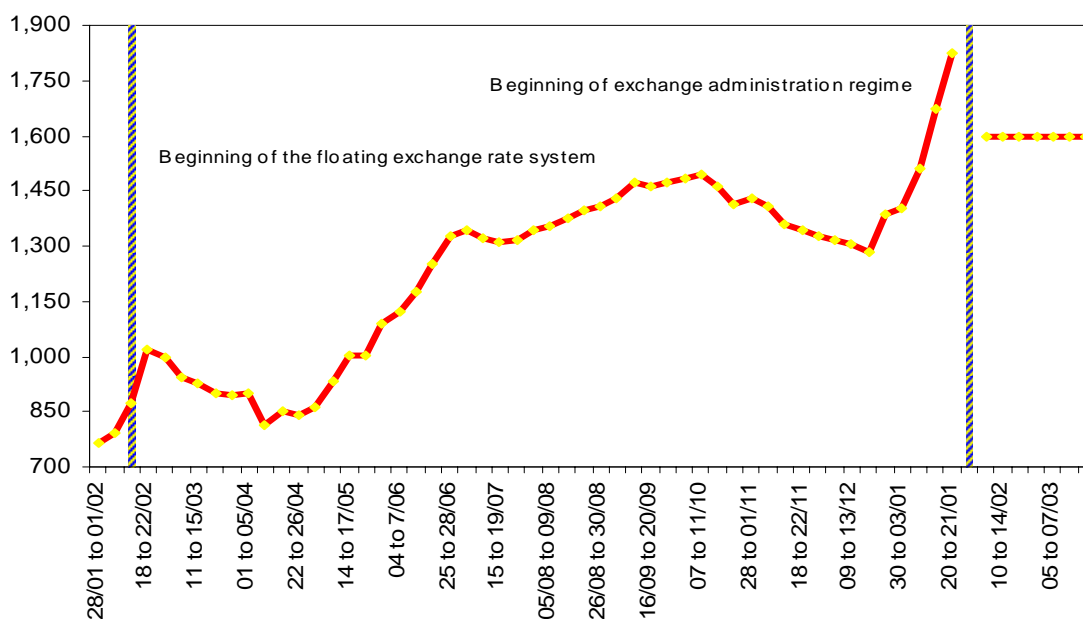
Interdaily volatility of the exchange rate, 2002-2003



Source: BCV

Figure 6

Weekly average nominal exchange rate, 2002-2003



Source: BCV

In a study of interventions in the foreign exchange market in Venezuela during the floating period, Pedauga (2003) identified moments in which the BCV was presumed to have intervened in the market to control for excess volatility. Most of these moments coincided or led by, one or two days, the date when the BCV intervened. However, this study identified fewer than the 50% of the days where the bank sold foreign currencies through the trading desk to moderate exchange rate volatility. On the other hand, some international comparisons suggest that during the float exchange rate volatility in Venezuela was higher than that of its main trading partners, with the exception of Brazil (see Table 1). This could provide evidence that the central bank probably was not very effective in moderating excess volatility in Venezuela. However, further studies need to be done in order to reach a final conclusion about the effectiveness of the foreign exchange interventions.

Table 1

Daily volatility of the exchange rate for Venezuela and its main trading partners, 2002

Currency	Average %	Maximum %	Minimum %
Bolivar	2.66	6.59	0.38
Real	2.81	4.68	0.46
Colombian peso	1.15	2.46	0.16
Yen	0.97	1.85	0.35
Chilean peso	0.93	1.52	0.27
Euro	0.87	1.45	0.36
Mexican peso	0.76	1.44	0.21
Pound sterling	0.63	1.31	0.19
Canadian dollar	0.63	1.06	0.21

Notes: All exchange rates are expressed in terms of US\$. The daily volatility is the standard deviation of the change in exchange rate, based on the average exchange rate reported by Reuters, using a historical window of 20 days for the period 18 February 2002 - 21 January 2003.

Interventions to control for excess volatility could only succeed in the short run when dealing with transitory disturbances (see Table 2). It was a hard task, however, to distinguish transitory from permanent disturbances during the float. If the nature of the disturbance is not identified and the magnitude of its impact on the economy is not taken into account, international reserves may be depleted when the exchange rate experiences a sharp increase.

One of the implications of systematic interventions in the exchange market is that the floating system tends to a regime with a fixed exchange rate and, as consequence, monetary policy becomes endogenous and its advantages for controlling inflation are lost. Moreover, if interventions are not sterilised, part of their potential effectiveness is due to the influence on monetary conditions and not exclusively to the interventions *per se*.

Table 2

Intervention and volatility of the exchange rate, March - December 2002

EIV[10, 30)	Average previous days			Average following days		
	15	10	5	5	10	15
1	2.7%	2.7%	2.7%	2.2% *	1.7% *	1.6% *
2	1.3%	1.0%	0.8%	0.6% *	0.6% *	0.6% *
3	0.6%	0.6%	0.6%	0.8%	0.7%	0.7%
4	0.7%	0.7%	0.7%	1.4%	1.5%	1.6%
5	2.1%	1.9%	1.3%	1.3%	1.7% *	1.8% *
6	2.0%	1.7%	1.2%	1.5%	1.8%	1.9% *
7	1.8%	2.1%	2.1%	2.2%	2.2%	2.3%
8	2.1%	1.9%	1.5%	1.1% *	0.8% *	0.7% *
9	2.1%	2.0%	1.7%	1.2% *	0.9%	0.8% *
10	2.2%	2.2%	2.2%	2.5%	2.5%	2.4%
11	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%
12	0.7%	0.7%	0.7%	0.6% *	0.7%	0.9%
13	1.5%	1.2%	1.1%	0.6% *	0.6% *	0.6% *
EIV[30,60)	15	10	5	5	10	15
1	0.6%	0.7%	0.7%	0.7%	0.7%	0.7%
2	0.7%	0.7%	0.7%	0.6% *	0.7%	1.0%
3	0.7%	0.7%	0.7%	0.6% *	0.6% *	0.8%
4	2.1%	2.2%	2.2%	2.2% *	2.3%	2.4%
5	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%
6	1.9%	1.5%	1.1%	1.7%	1.9%	2.0%
7	0.7%	0.7%	0.8%	0.7% *	0.7%	0.6% *
8	2.3%	2.4%	2.5%	2.5% *	2.4%	2.1% *
9	2.2%	2.2%	2.2%	2.5%	2.5%	2.5%
10	1.6%	1.3%	1.2%	0.5% *	0.6%	0.6% *
11	0.8%	0.6%	0.6%	0.6% *	0.6%	0.7% *
12	0.5%	0.5%	0.4%	1.3%	1.4%	1.7%
13	1.4%	1.1%	1.0%	0.6% *	0.6%	0.6% *
EIV[60 and more)	15	10	5	5	10	15
1	2.2%	2.2%	2.3%	2.2% *	2.4%	2.4%
2	0.6%	0.6%	0.7%	1.3%	1.6%	1.9%
3	0.6%	0.6%	0.6%	0.7%	0.7%	0.7%

Notes: "*" indicates smaller volatility after intervention (the comparison is made with historical windows of the same size before intervention). "EIV" indicates intervention to control for exchange rate volatility, whereas the amount (millions of US\$) between brackets refers to the range of sales of foreign currency through the trading desk.

4. Concluding remarks

In Venezuela, interventions to control volatility appeared to have had some success in the very short run. In addition, it was noticed that the more frequently the BCV intervened in the foreign exchange market, the smaller the effectiveness in moderating the volatility of the exchange rate. Finally, experience points out that the effectiveness of intervention is jeopardised in the absence of a sound macroeconomic environment. A formal study on this aspect should be undertaken.

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