

Gregorio, José De; Tokman, Andrea; Valdés, Rodrigo

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Flexible Exchange Rate with Inflation Targeting in Chile: Experience and Issues

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FLEXIBLE EXCHANGE RATE WITH INFLATION TARGETING IN CHILE: EXPERIENCE AND ISSUES

BY

**JOSÉ DE GREGORIO
ANDREA TOKMAN
RODRIGO VALDÉS**

CENTRAL BANK OF CHILE

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Abstract

The first five years of the flexible exchange rate and inflation targeting regime in Chile have shown positive results. Inflation is under control, the exchange rate has moved with the external conditions, monetary policy has been countercyclical and the cycle has apparently smoothened. Even though exchange rate volatility has increased, as expected with a flexible regime, this has also happened in other countries with similar characteristics. This increased volatility has lower extreme real exchange rate valuations than in the past, as is also seen in other countries with alternative exchange rate regimes. Important progress in derivatives market deepening, as well in a lower pass-through from the exchange rate to inflation, have contributed to increasing the credibility and feasibility of the current policy framework, while minimizing potential costs derived from that framework.

1. Introduction

Since 1999 the Central Bank of Chile's policy framework has included a full-fledged inflation-targeting (FFIT) regime and a floating exchange rate regime whereby the Central Bank intervenes only under exceptional circumstances. This framework was further complemented with the completion in 2000 of a gradual capital account integration process and the use of a nominal (as opposed to a consumer price-indexed) interest rate as a reference for monetary policy starting in 2001. Furthermore, this monetary framework has been actively supported on the fiscal front by a 1 percent structural surplus rule¹ and low public debt levels. It also relies on a healthy financial system, with strong bank regulation and supervision and a well-developed local bond market.²

This paper reviews the adoption of this framework in Chile, with particular attention to exchange rate developments. It first revisits the environment in which the flexible regime was adopted, including an exchange rate policy based on target bands and capital controls. Then it describes the structure of the current dual inflation targeting–flexible exchange rate framework and briefly evaluates its performance. Next, it describes how the framework has worked in practice under specific exchange rate developments. In particular, it reviews how monetary policy is supposed to react to exchange rate news and how it has actually reacted in specific episodes. With the same objective, it also revisits the logic behind interventions, including what are understood as exceptional circumstances, how actual interventions have been implemented and their effects. A discussion follows on three important issues related to exchange rate policy, namely the costs, benefits and implications of exchange rate volatility, the development of hedges, and the behavior of the pass-through. The paper ends with a few final remarks.

This paper shows that the flexible exchange rate regime in Chile has worked well. Exceptional interventions have happened only on two occasions, and for most of the time the peso has floated without intervention. Inflation performance has been satisfactory, with inflation usually within the target of 2 to 4 percent, and medium-term expected inflation has been anchored at the center of the band, which shows the credibility of the inflation targeting regime.

¹ A rule aimed at maintaining a fiscal surplus equivalent to 1 percent of GDP measured on a structural basis.

² See Marcel et al. (2001) for details on the fiscal rule. See De Gregorio and Tokman (2004) for a review of the exchange rate management experience in Chile. See Herrera and Valdés (2004) and Fuentes et al. (2003) for an analysis of indexation and nominalization in Chile. See Cifuentes et al. (2002) for a review of the Chilean financial market. See Cowan and De Gregorio (2005) for discussion of capital controls and their interplay with exchange rate policy.

Despite a turbulent external environment in recent years, the floating of the Chilean peso has helped the adjustment, while monetary policy has been clearly counter-cyclical. There has been an increase in exchange rate volatility, something that should be expected with the flexibilization of the exchange rate. However, the increase in volatility has also happened in other small open economies that are well endowed with natural resources and that have been floating for a long time (e.g., Australia, Canada, New Zealand and South Africa). Importantly, the increase in volatility has not been associated with persistent misalignments, as have more rigid regimes. On the other hand, important developments in the derivatives market and a reduction in the pass-through from exchange rate to inflation have strengthened the credibility and feasibility of the float.

2. The Road to a Flexible Exchange Rate Regime in Chile

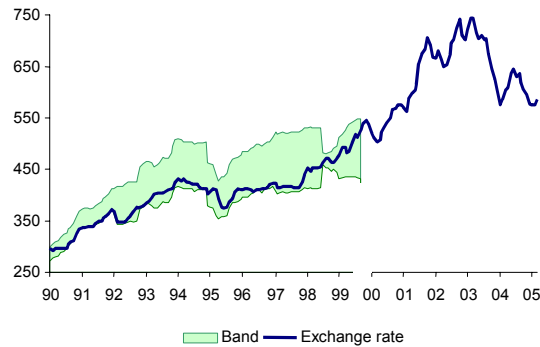
The Central Bank adopted the current policy framework, in particular exchange rate flexibility, after repeated problems with exchange rate rigidity. Although rigidity permitted a certain amount of stability, at the end such stickiness has been at the center of economic turmoil, such as the currency crisis in 1962, a severe depression in 1982, and the recession in the aftermath of the Asian crisis.

After an unsuccessful experience with fixed exchange rates in 1982, which ended with a devaluation and a recession, a crawling peg scheme was put in place. The scheme had an implicit objective of promoting a depreciated real exchange rate (RER) that could stimulate exports, helping the post-1982 recovery, and generating the required resources to repay the large external debt burden. Accordingly, the center of the band crawled with inflation differentials and was discretely realigned several times with what was believed to be the equilibrium RER. Discrete devaluations during the 1980s³ were followed by revaluations in the 1990s,⁴ when the equilibrium RER objective was either modified or more difficult to achieve because of significant pressure for appreciation. Indeed, the 1990s saw large capital inflows and low international interest rates. Domestic rates were high. International investors had renewed interest in Latin America, especially in Chile after a period of high growth initiated in 1985.

³ It was 23.7 percent in September 1984, 9 percent in February 1985, and 5 percent in June 1985.

⁴ It was 2 percent in June 1991, 5 percent in January 1992, 10 percent in December 1994, and 5 percent in January 1997.

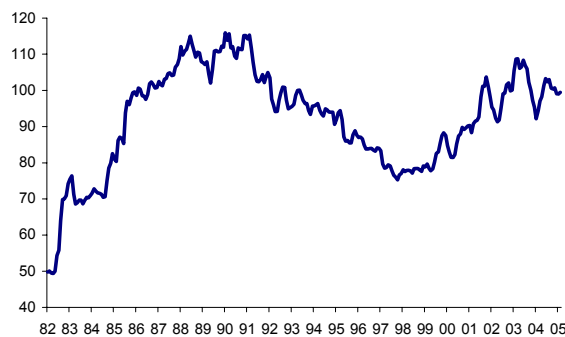
Figure 1. Nominal Exchange Rate and the Band, 1990-2005
(Pesos per dollar)



Source: Central Bank of Chile.

On top of realignments, the exchange rate band was widened several times, from ± 2 to ± 5 percent in mid-1989, ± 10 percent in January 1992 and ± 12.5 percent in January 1997 (Figure 1). Despite the apparently wide band, the nominal exchange rate was frequently at its floor during the 1990s, materially constraining the degrees of flexibility of monetary policy. The Central Bank had to constantly intervene in the market to support the band. Still, the widening band and interventions within it were unable to contain the large peso appreciation of the 1990s. During the 1990-97 period the real exchange rate appreciated at an average annual rate of 5.4 percent, accumulating a decline of 32 percent (Figure 2).

Figure 2. Real Exchange Rate, 1982-2005



Source: Central Bank of Chile.

The pressure to appreciate the currency drastically vanished with the Asian crisis. The depreciation was fought with forex interventions and tight monetary policy. In January and June, the Central Bank intervened by selling dollars and medium-term bonds payable in pesos but indexed to the exchange rate, while interest rates were significantly increased (in part due to unsterilized interventions). In addition, the band's width was radically squeezed to curb depreciation expectations: from ± 12.5 percent around the center to 2 percent above and 3.5 percent below the target.⁵

Selective capital controls were used during the 1990s as a way to obtain space to maneuver for monetary policy while targeting a depreciated RER. In 1998, after the Asian crisis, capital controls were eased and a seven-year experience of unremunerated reserve requirements came to an end when they were cut from 30 to 10 percent and subsequently to 0 percent.⁶

Defending the currency led to worries about endangering the two objectives of the autonomous Central Bank, enshrined in its Organic Law of 1989: "ensure the stability of the currency and the normal functioning of domestic and external payments." Authorities believed at the time that a relatively high pass-through from the exchange rate to inflation would have endangered price stability. In addition, if the depreciation was large, the corporate sector's dollarized liabilities and the excessive current account deficit would have led to financial vulnerability that would have put at risk the normal functioning of the payments system.

However, the credibility achieved by the narrowing band was short lived. Speculation started to build up against the band when a new shock (this time the Russian crisis) hit the economy. External financing costs grew, and credit availability for emerging economies declined severely. In addition, world stock and commodity prices fell dramatically. Unsterilized interventions caused interest rates to soar.

By September 1998, after several months of defending the peso within the narrow band, the Central Bank expanded the band to ± 7 percent and announced a gradual widening plan for the months ahead, reaching 10 percent by the end of 1998 and 16 percent by the end of 1999. This move was combined with a tightening of monetary policy (the consumer price-indexed monetary policy rate was raised from 8.5 to 14 percent). In December 1998 the band was discretely widened to ± 8 percent, and the gradual widening plan continued until August 1999,

⁵ Céspedes et al. (2004) analyze the Chilean policy response after the Asian crisis and compare it with those of Australia and Brazil.

⁶ The requirement was implemented in June 1991 and finally set to 0 in September 1999 (and abolished in 2000).

when it reached ± 11.7 percent. The discount for foreign inflation in the central parity was eliminated, and the center of the band was made to crawl according to an annual inflation target rather than past inflation. This was the first step toward abandoning the exchange rate objective and a further movement toward an FFIT.

By September 1999, when uncertainty and world turmoil had calmed down, the Central Bank finally announced the end of the exchange rate band—in fact, it had not intervened for months—and let the exchange rate float freely. From then on, the Central Bank would only intervene in exceptional circumstances, which were clarified not to be in defense of a specific RER trend, and would inform the public when such circumstances occurred.

As a luxury of analyzing with hindsight, it is tempting to think that the flexibilization of the exchange rate could have been undertaken sooner. The perceived costs of doing so were probably overstated as price and financial instability would have probably been less than expected. Pass-through and corporate mismatches were low, and the derivatives market had developed appropriately.⁷ Moreover, the falling costs of floating would have endogenously responded to the float and fallen even further. The flexible exchange rate would have further motivated development of the derivatives market and the adjustment of mismatched firms. A credible commitment with the inflation target would have reduced exchange rate pass-through to prices (see Campa and Goldberg 2001; Choudhri and Hakura 2001; Gagnon and Ihrig 2001). In addition, such a commitment would have required less monetary tightening and possibly yielded a totally different outcome, with reduced output costs.

However, movements toward more flexible regimes were typically associated with greater macroeconomic instability (see Eichengreen et al., 1998 and 1999), and policymakers do not wish to increase instability in an already unstable situation. Moreover, only involuntary exchange rate regime changes cause worse growth, inflation and exchange rate volatility outcomes (IMF, 2004). Voluntary floats are much less disruptive and therefore more desirable. In such circumstances, it is possible that giving in to the pressures on the band in 1998 would have implied a more complex scenario than finally occurred. However, we think this argument is less important, given the strengths that the Chilean economy has been building for more than a decade.

⁷ Indeed, De Gregorio and Tokman (2004) document that all conditions for floating were met before the Asian crisis.

As is well known, capital controls may permit an independent monetary policy with some form of exchange rate targeting. This was actually the route chosen in Chile during the 1990s and, because of the very good performance of the Chilean economy during that period, it has been the subject of academic research as well as policy discussion.⁸ Indeed, for many observers, capital controls were at the heart of Chile's success. We dispute this view by arguing that the role of capital controls was not central, and that most of the tensions regarding capital flows were due to rigidities in the exchange rate system. There is no way to know what the counterfactual of the 1990s would have been without controls and with a fully flexible exchange rate. However, abundant empirical evidence shows limited effects of capital controls.

Most of the studies have found no effect on the total volume of capital flows, or on the evolution of the real exchange rate. Only effects on the composition of capital flows and the domestic interest rate have appeared, although the magnitude of the effects is not large, and it is unclear in the latter case how much is due to relabeling.⁹ Furthermore, there is evidence that countries with fixed and intermediate exchange rate regimes (as opposed to flexible ones) experienced larger inflows during the 1990s and that capital controls did not have any effect on inflows (see Cowan and De Gregorio 2005 for details). Apparently, it is the exchange rate system, and not restrictions on capital flows, that lies at the center of experiences with large capital inflows.

Finally, it should be stressed that capital controls in the 1990s did not prevent the attacks on the Chilean peso in 1998. Still, perhaps the most persuasive evidence of the limited effects of capital controls comes from Chile's experience with the crisis in 1982, when the exchange rate was fixed and capital controls on short-term flows were not allowed. The external debt was mostly long term. The controls did not prevent the collapse, which in the context of a weak financial system caused not only a currency crisis, but also a large banking crisis. The

⁸ See De Gregorio et al. (2000) for a review of this experience and Cowan and De Gregorio (2005) for a recent assessment with a discussion of existing empirical evidence.

⁹ Williamson (2000) has argued that this evidence is flawed because of inconsistencies. The reason is that by affecting interest rates one should expect that capital flows and the exchange rate would be affected. However, the evidence shows that the effects on interest rates are small and short-lived, and hence their effects on inflows and exchange rates become even smaller. In addition, the fact that capital controls do not have effects on the volume of inflows but have effects on interest rates is not inconsistent, since the effects on interest rates could affect asset prices via arbitrage without having effects on flows. Therefore, one should ask why interest rate effects did not affect the exchange rate. This is not a surprise, since the effects of the unremunerated reserve requirement on interest rates were small and thus explained little of the exchange rate movements.

combination of a fixed exchange rate and weak financial supervision caused the collapse; capital controls played a secondary role.

3. The Current Policy Framework

Full-Fledged Inflation Targeting

The current inflation targeting framework is the result of 10 years of gradual convergence to industrial countries' inflation levels, a process that was based on annual announcements every September of the subsequent year's December/December consumer price index (CPI) inflation target. This successful slow convergence process was implemented within a regime that was similar to an inflation targeting regime (Morandé 2002). The most important difference was that the target was set for December of the following year, about 16 months ahead of the announcement, which implied that, given lags, after a couple of months monetary policy would have almost no effect on the achievement of the target. This procedure probably put pressure on the exchange rate as the only instrument that could have helped to meet the inflation target in a short horizon.

In 1999 a full-fledged inflation targeting regime was adopted, with December 2000 as the date when the new regime was supposed to be fully operative. The permanent inflation target was set at a 2 to 4 percent band, centered at 3 percent, for annual CPI inflation.

Considering the lag in monetary influence on inflation, and also that it would be too costly in terms of output volatility (and interest rate volatility) to counteract price shocks once and for all, the monetary policy decisions have as the relevant horizon the following 12 to 24 months. In practice, this means that the horizon forecasts are the operational objective for the Central Bank; if inflation substantially diverges from 3 percent, or there is a large probability that this may happen, the monetary policy instrument (in turn, a target for the overnight interbank interest rate) should be adjusted. Longer than 24-month horizon forecasts and risk scenarios are also considered in order to assess alternative paths for monetary policy.

The forward-looking nature of this framework implies that under some circumstances monetary policy requires adjustment even when current inflation is 3 percent or, alternatively, that transitory shocks may not need any monetary policy reaction. This does not mean that current inflation is irrelevant, but its importance critically depends on how it weighs on future inflation. Transitory deviations from the 2 to 4 percent band are possible and accepted, but only

if it is expected with relative certainty that inflation will be back around 3 percent within 12 to 24 months. Of course, when headline inflation falls outside the band, there is a natural motivation to explain the nature of deviations and when and how inflation is expected to fall back inside the band.

The inflation target is set for headline CPI inflation to give credibility to the target, while core CPI measures are used to analyze, communicate and forecast inflation pressures. In addition, the inflation target is symmetric, which implicitly penalizes positive and negative deviations from the band equally.

The key inflation-targeting parameters have not been announced as state contingent. Therefore, in principle, they do not depend on the configuration of shocks hitting the economy. Of course, under a particular set of shocks, it may happen that inflation deviates from the band. Interest rates should be adjusted in order to assure that this deviation will be transitory.

Finally, it should be mentioned that transparency is a fundamental component of the inflation targeting framework. Transparency allows the Central Bank to be both more accountable and more efficient in its conduct of monetary policy. Accountability is a central component of Central Bank independence, whereas monetary policy efficiency is highly desirable for enhancing the benefits and limiting the possible costs of monetary policy in terms of inflation and output volatility.

The framework has the standard instruments for communicating the rationale of policy decisions, namely the following four. First, the *Monetary Policy Report* is generated every four months and includes an evaluation of recent developments and detailed forecasts for output and inflation; it is presented to the Senate of the Republic and several other places. Second, communiqués are made public immediately after each monthly monetary policy meeting to provide information about the rationale of the decision. Third, detailed minutes containing the monetary policy meeting analysis, including data and evaluation of policy options, are published one week before the subsequent monetary policy meeting (thus, on average, three weeks after the meeting that it describes). Fourth, Board members and senior staff make public speeches.

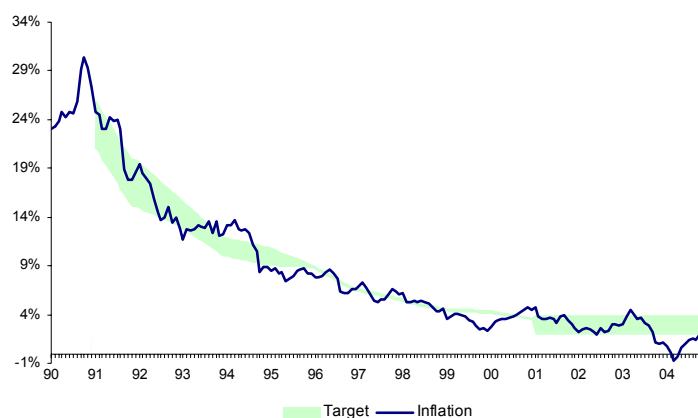
A brief evaluation of the inflation targeting regime shows that, at least so far, it has served the Chilean economy well. Its infant stage allowed a gradual decline in inflation starting in 1991, as inflation dropped from almost 30 percent a year to less than 5 percent. After the announcement of the permanent target, inflation averaged 2.7 percent between January 2000 and

March 2005, with a peak of 4.7 percent and a trough of –0.7 percent. During the same period, inflation was between 2 and 4 percent two-thirds of the time (see Figure 3).

The inflation targeting framework has endowed the economy with a strong nominal anchor. Different measures of expected inflation show that the number 3 percent appears to be an attraction for longer-run forecasts. For instance, the Central Bank’s monthly survey shows that expected inflation for two years ahead is seldom different from 3 percent. The implicit inflation compensation that can be calculated from same-maturity CPI-indexed and nominal Central Bank bonds (which amounts to the sum of expected inflation plus unknown and variable risk premium) also tends to revert to 3 percent (see Figure 4).

Monetary policy in Chile has been strongly counter-cyclical throughout the full inflation targeting period. Indeed, real interest rates have been substantially below alternative measures of the neutral real interest rate whenever the output gap has been negative. Figure 5 presents a scatter plot with output gaps since 1993 and a measure of monetary policy intensity calculated as the difference between the real monetary policy interest rate and the implicit forward real interest rate in indexed contracts expected to prevail in the long run.¹⁰

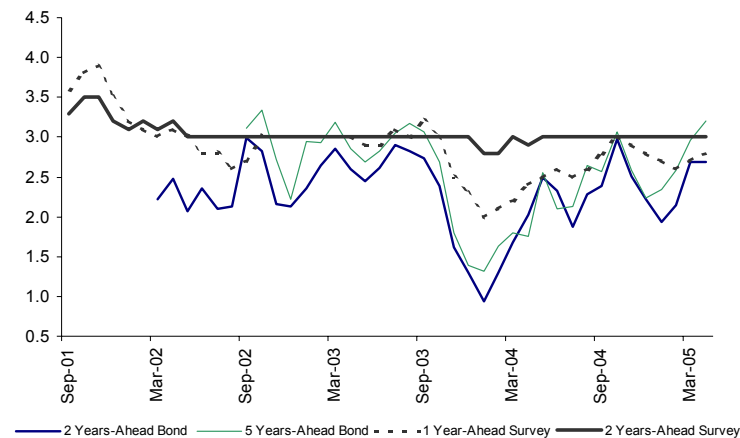
Figure 3. Consumer Price Index Inflation and the Inflation Target
(Percent)



Source: Central Bank of Chile.

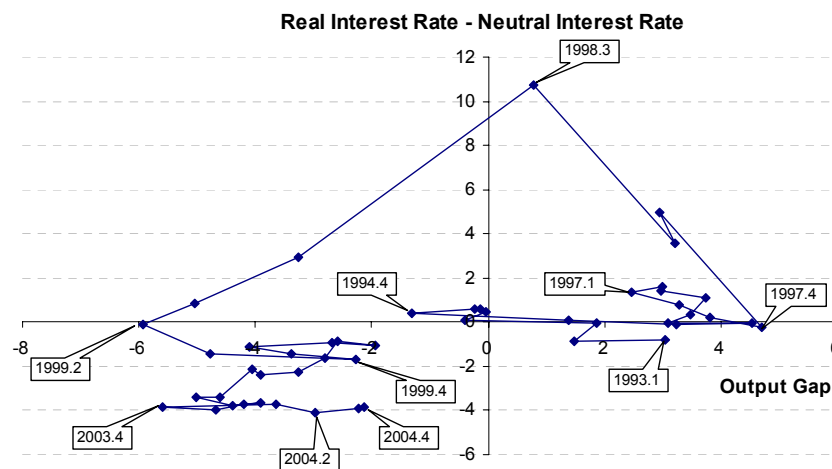
¹⁰ For the period in which monetary policy used a nominal interest rate as the operational instrument, the real monetary policy interest rate was calculated as the difference between the nominal rate and the one-year-ahead expected inflation measured by the Central Bank survey.

Figure 4. Expected Inflation Measures
(Central Bank nominal bond inflation compensation and surveys in percent)



Source: Central Bank of Chile.

Figure 5. Counter-Cyclical Monetary Policy under Inflation Targeting
(Real minus neutral interest rates and output gap)



Source: Central Bank of Chile.

The Flexible Exchange Rate Regime

A flexible exchange rate regime is consistent with the inflation targeting framework and the acknowledgement that keeping inflation in check would be very difficult with two nominal anchors—the exchange rate band and the inflation target. The inflation target would become the sole basis of an anchor only if the exchange rate were allowed to float.

Together with letting the peso float, the Central Bank reserved the right to intervene. The monetary authority has maintained that, during exceptional episodes of uncertainty and volatility, with the possible adverse economic effects of an overreacting exchange rate, a Central Bank intervention in the exchange rate market may be desirable.¹¹ It has also declared that, consistent with the aim of transparency, should such circumstances occur, it will make public the rationale for such a decision.

A brief evaluation of the almost five years of operation shows that the flexible regime has also served the economy well. First, the floating regime has been crucial in allowing the Central Bank to run independent monetary policy aimed mainly at the inflation target, but that could also be used as a stabilization tool. In fact, since the exchange rate was allowed to float, the Central Bank has followed a strong counter-cyclical monetary policy, more marked than during the 1990s.

Second, exchange rate flexibility is clearly desirable in economies that are frequently exposed to real shocks, as in the case of Chile and its terms of trade. Exchange rate movements contribute to the required adjustments in relative prices that produce the necessary shift in resource allocation, reducing the impact on output and employment. When the real shock calls for a depreciation of the currency, the effects of the shock are magnified if the exchange rate adjustment channel does not operate. Thus, under a floating regime, the exchange rate gains importance as an adjustment mechanism, while reserves and interest rates should become more stable. The recent Chilean experience shows that this has indeed been the case. After strong negative shocks in 2001 and 2002, Chile was able to accommodate an important RER depreciation that facilitated the way the economy adjusted to these new conditions (see Table 1).

¹¹ See Box II.4 in the *Monetary Policy Report* of January 2003.

Table 1. Selected Indicators

Year	Real exchange rate (1986=100)	Copper price (dollars/lb)	Latin American EMBI	Trading partners' growth (percent)
1990s	92.0	1.009	771 ^a	3.1
2000	86.0	0.823	665	3.8
2001	95.8	0.715	867	1.6
2002	96.9	0.707	965	1.9
2003	104.3	0.807	700	2.8
2004	99.3	1.300	527	4.5

Source: Central Bank of Chile.

a: Average for 1998 and 1999 only.

Third, the floating regime has made more obvious the risks of mismatches to both the private and public sectors and has been a powerful incentive for the development of hedges. The evidence in Chile is that the private sector is adequately hedged, and the derivatives market for foreign exchange has developed since the peso has been allowed to float (see Section 5).

Finally, although it is still too soon to evaluate with certainty, it is interesting to notice that, contrary to the norm in the 1990s, domestic demand has not reacted briskly or in a disorderly manner to abnormally advantageous conditions in the most recent past. In addition to the strong fiscal performance, the contribution of the exchange rate regime to this improved performance cannot be ruled out.

4. The Exchange Rate and the Policy Framework at Work

Within the framework described in the previous section there are two basic types of policy reactions to news from the exchange rate front. First, monetary policy could be adjusted if the new information modifies the expected path of inflation. And second, news may trigger an intervention policy under exceptional circumstances, such as the adverse economic effects of an overreacting exchange rate.

Exchange Rate and Monetary Policy Reactions

As for inflation forecasts and monetary policy, the evaluation can be separated into two main steps. The first is the likely path of the exchange rate under the assumption that the policy path is unchanged. The second is the evaluation of the exchange rate path's effect on inflation.

The standard benchmark of the exchange rate path assumes uncovered interest rate parity (including both country and exchange rate risk premiums) and an estimate of the “long-run” equilibrium exchange rate. News on the exchange rate can therefore be assigned to a combination of a new path of interest rate differentials and movements in the equilibrium real exchange rate. The part assigned to changes in the equilibrium real exchange rate is assumed to be permanent. Of course, since the volatility of the exchange rate is much larger than what can be accounted for by interest rate differentials, exchange rate movements are more often than not treated as persistent (or even permanent).

An especially interesting case occurs when the evaluation of the long-run equilibrium real exchange rate results in numbers that are substantially different from the current level of the exchange rate and the difference cannot be accounted for by interest rate differentials. In this case, it is possible to assume a future reversion of the exchange rate to “equilibrium levels.” At the Central Bank, the analysis of the equilibrium real exchange rate is based on several alternative models.

Having assessed the most likely path of the exchange rate, the next step is to evaluate the impact of this new path on inflation. The standard analysis considers direct effects through costs, and possible second-round effects due to other price and wage reactions, including indexing clauses.¹² A key “reduced form” parameter for measuring the impact of exchange rate innovations on inflation is the pass-through coefficient—the ratio between changes in the nominal exchange rate and the CPI at different horizons. The core model has a pass-through coefficient of roughly 20 percent in one year, 25 percent in two years and a peak of 30 percent in three years. These numbers are substantially smaller than the perceived pass-through coefficient a few years ago. After this two-step evaluation, the Central Bank Board analyzes the most appropriate monetary policy reaction given the new likely path of inflation.

Two concrete examples in the recent Chilean experience underscore the importance of this evaluation process in determining the monetary policy reaction. These two episodes show

that there is no mechanical relationship between exchange rate movements and the monetary policy interest rate. Both times the monetary policy was loosened, but in one case with a peso appreciation, while in the other with a peso depreciation.

Between August 2003 and January 2004, the real exchange rate declined (the peso appreciated) by 13 percent. In the September 2003 *Monetary Policy Report*, at the beginning of this exchange rate shift process, inflation forecasts assumed a “slight real peso appreciation over the projection horizon.” Four months later, the January 2004 *Report* began by recognizing that inflation “fell significantly and unexpectedly because of surprisingly low cost pressures.” Inflation was 2.9 percent in August 2003 and 0.8 percent in January 2004. A key driver of these lower cost pressures was the peso appreciation, deemed as “surprisingly fast and considerably greater than expected.”¹³ The new forecasts assumed that “the peso will remain stable [...] over the projection horizon.” The monetary policy reaction was to cut interest rates by 100 basis points to 1.75 percent (50 basis points in both the December and January monetary policy meetings). Interestingly, the forecast for average CPI inflation for 2005 dropped from 3 to 2.7 percent after that. The output growth forecast for 2004 increased between reports from a range of 4 to 5 percent to 4.5 to 5.5 percent. The Central Bank defended the monetary policy changes as necessary to reduce the risk of inflation falling below the target for too long and thereby delaying the return to 3 percent inflation.

An earlier episode, this time without triggering an evident monetary policy reaction, took place during part of 2002. Between May and September the real exchange rate increased (the peso depreciated) by more than 10 percent. However, over the same period, interest rates were *cut* by 125 basis points. The average inflation forecast for 2003 was 2.8 percent in May and 3 percent in September, whereas forecast output growth dropped from 5.8 percent in May to 3.5 to 4.5 percent in September. The movements of the exchange rate were understood as a reaction to interest rate differentials (in fact, a 2-percent appreciation was part of the baseline scenario assumptions in September) and deterioration in external conditions, both regional financial conditions and global output growth. The exchange rate reaction was understood as part of the adjustment process—the natural reaction of the floating regime to the external outlook probably

¹² Details on the mechanics embedded in the Central Bank core model can be found in Central Bank of Chile (2003).

¹³ Quotes are from the September 2003 and January 2004 *Monetary Policy Reports*. The other factor, accounting for up to 1 percentage point in the drop of inflation, was a large compression in retail markups thanks to competition and technology, particularly in supermarkets.

amplified by the monetary policy reaction to this worsening environment—and positive for sustaining export growth.

Exchange Rate and Interventions

As for reactions through intervention in exceptional circumstances, the Central Bank has made public the view that interventions could be warranted in cases when there is an overreaction of the exchange rate and that this overreaction could be damaging for the economy.¹⁴ An overreaction of the exchange rate could require movements in the monetary policy interest rate in the opposite direction of what the output gap and its implied inflationary pressures would suggest. Therefore, intervention can be seen as a first line of defense against inflation during periods of turmoil before adjusting monetary policy. For example, a sharp depreciation could generate inflation that would require compensation through monetary policy tightening. But if the exchange rate movement were an overreaction, this monetary tightening would unnecessarily deepen the cycle. If the central bank does not intervene, an excess depreciation, larger than required for adjusting the real exchange rate, could result in inflation and undo the real effects of the nominal depreciation. Indeed, it is likely that a depreciation that pushes the real exchange rate above its equilibrium level would bring inflation. This inflation, in turn, would validate an initially excessive depreciation. Before tightening monetary policy it may be advisable to intervene. However, a central bank has to be careful in intervening because it may be tempted to fight inflation with exchange rate misalignment, a clear recipe for disaster. For this reason, to avoid becoming addicted to intervention, the Central Bank has decided to be transparent, to justify fully the reasons for intervention, and in practice to define a clear timeframe and maximum magnitude for intervention.

The Central Bank has explicitly recognized that detecting an exchange rate overreaction or overshooting is not an easy task. Even in cases when the Board lacks full certainty about an overreaction, it may be advisable to intervene. On some occasions such interventions may be ineffective, but the cost of intervening outweighs the expected costs of unjustified turmoil.

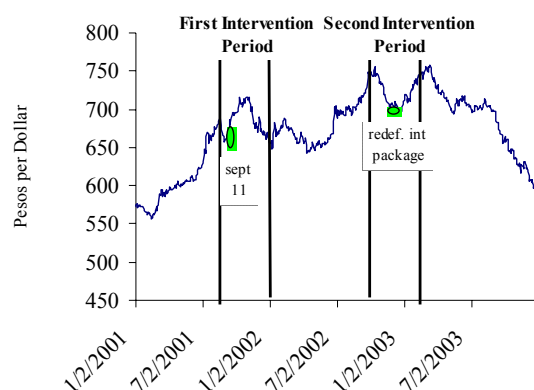
In the end, determining exceptional circumstances or whether the exchange rate is overreacting is a judgment call of the Central Bank Board. However, it is an informed call grounded in thorough analysis based on different perspectives. Ways of classifying these

¹⁴ See Box II.4 in the January 2003 *Monetary Policy Report*.

perspectives are (i) evaluation of the real exchange rate level through a number of methods and models (Calderón 2004; Caputo and Dominichetti 2005; Calderón and Duncan 2003), and (ii) evaluation of market functioning and perceptions.

Since the adoption of the flexible exchange rate regime, the Central Bank has judged on two occasions (August 2001 and October 2002) that such circumstances were present. The episodes coincided with financial turmoil stemming from the convertibility crisis in Argentina in 2001, further enhanced by the economic effects of the September 11 attacks, and turbulence in Brazil around the presidential elections in 2002 (Figure 6).¹⁵ The apparent misalignment of the RER justified the adoption of a pre-announced package of intervention measures with a fixed four-month term and maximum amounts to be used in spot and dollar-indexed bonds.

Figure 6. Nominal Daily Exchange Rate and Intervention Periods



Source: Central Bank of Chile.

In both cases, alternative RER and misalignment measurements revealed an atypically undervalued peso. The instruments used by the Central Bank led to the conclusion that the depreciation was excessive and not in line with fundamentals. As such, it was expected to bring costs in terms of inflation that would have ultimately required a tightening monetary policy when the economy was slowly starting to recover and the output gap was still large.

The approach to intervention was transparent—announced, fixed in length, and with maximum amounts—in line with interventions affecting the exchange rate through expectations (what is commonly known as the signaling channel) that change only if it is perceived that the central

bank is doing something. That is, it is actively intervening or providing information to the market that the exchange rate movements are unjustified by fundamentals. In fact, according to Tapia and Tokman (2004), the announcement itself produced the greatest effect on the exchange rate. They find that the effect was immediate (as can be seen in Figure 6), even before any spot or dollar-indexed bond sale occurred. In addition, they find that the announcement of an “exception period” produced a change in the exchange rate trend. These findings are consistent with some recent literature on the role of communication or official central bank statements (Tivegna, 2001; Fatum and Hutchinson, 2002; Jansen and de Haan, 2003). Furthermore, the announcement of a fixed term for intervention and maximum resource availability was useful as a way to protect both the credibility of the floating regime and the inflation target as the anchor of the economy.

Although similar in nature, the intervention periods differed in both the actual amounts used and the effects on the exchange rate market. The 2001 intervention episode involved US\$803 million in spot interventions¹⁶ and US\$3 billion in dollar-indexed bond sales (including the regular rollover program). During the 2002-03 period there were no spot sales, and bond sales were cut in half in the middle of the period when uncertainties were judged to have cleared. This time, total interventions amounted to US\$1.5 billion in bonds.

The final effect on the exchange rate was greater during the first intervention period than the second one, with appreciations of 3.9 and 2.1 percent, respectively.¹⁷ However, the initial reaction was larger after the second intervention announcement. This could be explained by the credibility gained during the first episode and/or by a more fundamental pressure in the first period than in the second. Tapia and Tokman (2004) report that when fundamentals are controlled for, the impact of the announcement appears stronger in the 2001 intervention period. They advance the hypothesis that this could be because in the second period, given the 2001 experience with actual and announced amounts, the market had already assigned a lower probability that the maximum resources set for intervention would be used.

¹⁵ For details, see De Gregorio and Tokman (2004).

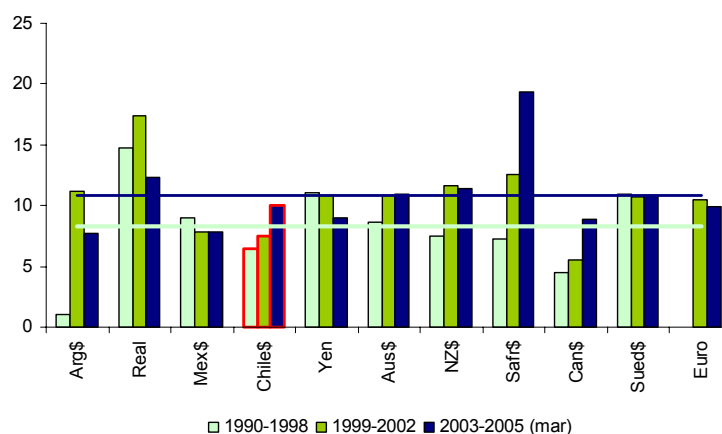
¹⁶ Less than half the initially announced maximum amount.

¹⁷ It had accumulated a depreciation of nearly 5 percent in September 2001, primarily because of the effects of the September 11 terrorist attacks, and an appreciation of 8.8 percent by December 2002, before the intervention strategy was redefined.

5. Volatility, Hedging, Extreme Valuations and Pass-Through

One of the most important shortcomings of flexible exchange rates is that they are more volatile than other regimes. Changes in financial conditions result in immediate changes in the exchange rate. Moreover, the exchange rate may fluctuate even more than fundamentals (that is, overshoot, as in Dornbusch, 1976). In this context, it is not surprising that Chile's exchange rate volatility has risen considerably since the exchange rate was allowed to float. The levels, however, are not excessively high by international standards (Figure 7). Moreover, one cannot attribute all of the increase in volatility to the fact that the Chilean peso started to float. Small open economies with a natural resource base, such as Australia, Canada, South Africa and New Zealand, have had higher volatility in recent years compared with the 1990s, despite the fact that they were already floaters.¹⁸

Figure 7. Currency Volatility



Source: Riskmetrics.

Naturally, volatility has costs (and some benefits). On the one hand, the corporate sector could suffer from mismatches, which could induce balance sheet effects that might weaken its financial position. On the other hand, authorities realizing these risks could be unwilling to let the exchange rate fluctuate, generating the so-called “fear of floating,” inducing rigidities that are particularly costly in periods of turmoil. Indeed, if the private sector knows that the authorities

¹⁸ In South Africa there were a few years in the 1990s when multiple exchange rate regimes were in place. For most of that decade, however, the exchange rate was floating.

will be unwilling to let the exchange rate fluctuate excessively, it may be induced to take more currency risk. On the contrary, volatility induces more careful currency risk-taking.

However, the Chilean corporate sector was and is adequately matched in terms of currencies (De Gregorio and Tokman 2004). This was true even before the band was abandoned, which signals that regulation was appropriate and the band itself was not seen as a completely free insurance. The commitment to inflation control, even in the band period, and the continuous discrete adjustments of the band were crucial in signaling that the exchange rate insurance was not complete. These factors motivated firms and banks to reduce exposure and cover for exchange rate risk. Local companies with international trade operations or foreign exchange exposure of liabilities in their balance sheets demanded hedging instruments, driving the development of the foreign exchange derivatives market even before the float. This was even more importantly after the float, when subscriptions of forex derivatives more than doubled in five years (Table 2).¹⁹ Furthermore, with the new regime there has been an increasing use of other instruments such as forex swaps and cross-currency swaps, while traditional instruments have kept growing in size. Across emerging countries, Chile's total turnover (as of April 2004) in spot, forward and forex swaps has been relatively high (8 percent of GDP), much higher than the 5.8 percent average of emerging countries (BIS, 2005).

Although the private sector can buy insurance in order to avoid volatility, insurance has a cost. The cost of hedging has declined in the period, further contributing to reducing the risks of exchange rate volatility and encouraging more firms to hedge currency risk (last column of Table 2). The bid-ask spread of a forward contract is at levels similar to those of developed countries; for example, in 2003 it reached about 17 basis points (see Alarcón et al., 2004).

¹⁹ The active participation of pension funds offering forward contracts has also encouraged the development of the derivatives markets. Indeed, in recent years the limits of investment abroad by pension funds have been raised, which has led to significant capital outflows while they have sold forward their foreign exchange open positions.

Table 2. Foreign Exchange Derivative Market in Chile

Year (December)	Market (million of dollars):			Turnover as % of:		% firms with FX hedges
	Local	Foreign	Total	GDP	Total trade	
1993	2,822	-	2,822	0.06	0.14	8.0
1994	9,415	-	9,415	0.18	0.40	10.0
1995	21,124	-	21,124	0.32	0.66	15.0
1996	47,828	-	47,828	0.63	1.38	17.0
1997	112,050	-	112,050	1.35	2.89	21.0
1998	112,150	-	112,150	1.41	3.10	21.0
1999	125,494	20	125,514	1.72	3.79	26.0
2000	139,228	11,646	150,874	2.01	4.00	29.0
2001	143,192	20,308	163,500	2.39	4.53	35.0
2002	130,686	30,414	161,101	2.39	4.55	31.0
2003	165,835	41,592	207,427	2.88	5.13	33.0

Source: Central Bank of Chile.

From a private perspective, insurance eliminates the costs of volatility; at the aggregate level this is not the case because another agent has to bear this volatility. Naturally, this other agent is most likely better prepared for the task, for instance by having a natural match. With a managed exchange rate system the government or the central bank bears the cost, while under floating the private sector pays the cost. Of course, there should be a reason why the government is willing to assume the cost of insurance, and this certainly will be related to some externality, which could be the case of large swings during turmoil. This justifies some intervention in exceptional periods, but it is difficult to find an argument in favor of the optimality of eliminating volatility when hedge markets are developed. Presumably there are stronger reasons to propose some form of stabilizing exchange rate fluctuations when the domestic financial market is less developed, but these reasons are less relevant in the presence of deep financial markets. However, a word of caution is in order when exchange rate stability is grounded on a thin derivatives market, since government intervention itself may be in part responsible for the low development of this market. In fact, this is what the evidence shows, namely, that countries with fixed and intermediate exchange rates have the least developed derivatives markets (De Gregorio and Tokman 2004).

So far we have analyzed volatility using the standard deviation of daily changes, that is, a measure of square deviations around the mean rate of change. Moreover, if the exchange rate follows a random walk—which is generally difficult to reject using short spans of data—the

relative measures of volatility should be independent of the frequency of the data. Whether daily, weekly or monthly changes are considered, the results should not be very different.

Nevertheless, from the point of view of resource allocation and implications for activity and growth, this is not necessarily the best measure of exchange rate instability. For example, many countries choose to fix the exchange rate, and, while it lasts, volatility is zero, but when it collapses the cost is huge. We can interpret this as a period of low volatility but persistent misalignment. More generally, one can think of the probability of having extreme valuations as an important characteristic of an exchange rate system. One way to measure this, and this is what we do next, is to compute the (root) average square of the misalignment. This is a standard deviation, but rather than around the mean rate of change, which could differ from the long-run equilibrium, it is a deviation around some definition of the equilibrium exchange rate.

Of course defining and then estimating equilibrium exchange rates is a complex issue. For this reason we use four measures of equilibrium exchange rate, and the misalignments are presented in Table 3. The first two columns are based on the estimation of the equilibrium real exchange rate of Caputo and Dominichetti (2005). The estimation considers as explanatory variables the terms of trade, net foreign assets, the productivity differential between Chile and its trading partners, government expenditure and tariffs. The first column defines misalignment as the difference between the actual and the fitted value (residuals of the regression), and the second column measures the long-run equilibrium as the average predicted value for the long-run averages of the explanatory variable. Finally, the last two columns use simple HP filters, with low and high smooth parameters, respectively.

Four periods of exchange rate management in Chile are considered for this analysis. The first year of each period is not included to avoid misalignment remaining from the previous regime. The first period is the *tablita*—programmed daily devaluations and the fixed exchange rate periods up to 1982. The 1982.III to 1984.I period is not included because it was a time of many different regimes, and it consisted basically of managing a severe currency crisis. The next periods include the narrow exchange rate band from 1984 to 1991, the wider band from 1991 to 1999, and the float from 1999 up to the present day.

Table 3. Real Exchange Rate Misalignment in Chile, 1979-2004
(Percent)

Period	Residuals	Long-run Eq.	HP low	HP high
Average of squared misalignment				
<i>Tablita</i> + fixed (1979.I – 1982.II)	24.7	31.0	15.1	22.9
Narrow band (1985.II – 1991.IV)	8.4	21.5	4.3	23.1
Wider band (1993.I – 1999.III)	9.9	9.6	3.1	12.5
Float (2000.IV - 2004.IV)	10.7	7.5	4.6	4.7
Maximum undervaluation				
<i>Tablita</i> + fixed	5.1	*	19.1	6.8
Narrow band	16.7	33.3	9.7	33.3
Wider band	3.9	9.3	4.6	8.2
Float	22.6	15.7	9.1	8.6
Maximum overvaluation				
<i>Tablita</i> + fixed	-41.6	-41.3	-23.8	-37.4
Narrow band	*	*	-5.9	*
Wider band	-19.4	-16.8	-6.5	-21.9
Float	-2.8	-3.3	-7.5	-8.3

* During this regime there were no undervaluations or overvaluations.

Source: Authors' calculations.

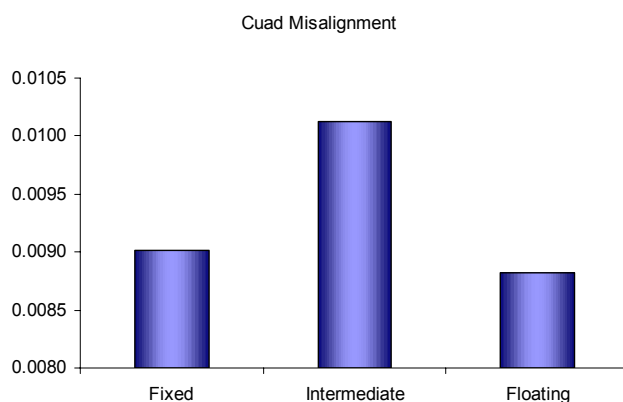
Table 3 shows that despite the volatility of the exchange rate during the period of floating, the misalignment has been in general the lowest. In those measures that more closely resemble the high-frequency volatility concept—the fitted errors of the RER equation and the low-smoothing HP parameter—the floating regime does not look that different. However, when smoother equilibrium RER measures are taken into account, the floating regime appears with smaller extreme valuations.

The figures for under and overvaluation show that the floating period has been relatively more undervalued than overvalued compared with the other periods. Only the narrow band period shows a persistent undervaluation, which was largely due to the lack of access to international financial markets. This resulted in a significantly depreciated real exchange rate that was sustained by the absence of capital flows and a high level of external debt. Overall, the evidence shows that the floating period has had one of the lowest deviations from equilibrium,

which is consistent with a regime that allows prompt adjustment to changing external and domestic conditions.

The international evidence also supports the view that a flexible exchange rate regime has a better chance of tracking the equilibrium exchange rate. The square of the misalignments for fixed, intermediate and floating regimes for a sample of 60 countries²⁰ shows that, indeed, the lowest deviations occurred in countries with flexible exchange rates, and the highest in intermediate regimes (Figure 8). Although one might expect larger deviations for fixed exchange rate regimes, it is likely that there is selectivity bias. Countries that are unable to sustain a fixed exchange rate because of misalignments are likely to move to some intermediate regime, while countries that are able to sustain a fixed exchange rate are precisely those that do not experience large deviations from the equilibrium.

Figure 8. Quadratic Misalignment in a Panel of Countries



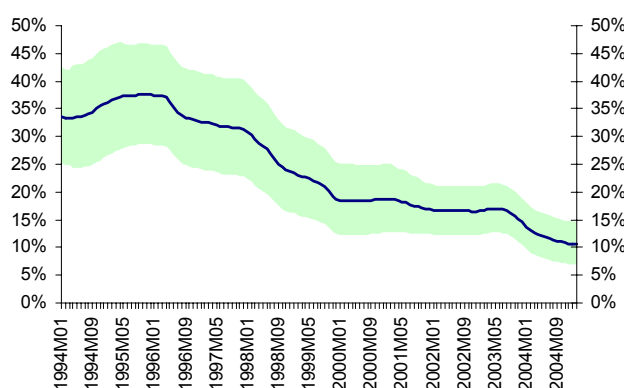
Source: Authors' calculations based on Aguirre and Calderón (2005) and Rogoff and Reinhart (2004).

Finally, it is interesting to note that, although the floating regime has increased short-run exchange rate volatility, its weight in determining inflation has apparently declined substantially. Compared with historical values, pass-through coefficients were low when the peso was allowed to float and have been falling ever since (Figure 9). For instance, in 1999 the Central Bank considered this coefficient to be 50 percent for a one-year horizon and 70 percent in an overheated economy, such as Chile in 1997 (Central Bank of Chile, 1999).

²⁰ The misalignments are estimated for 5-year windows from 1965 to 2003 for 60 countries from Aguirre and Calderón (2005). The countries are classified by the regime (according to Rogoff and Reinhart's classification) that was in place for more than half of each window (3 of 5 years).

Although lower pass-throughs are apparently also a global phenomenon, it has been argued that this has been a response to the credibility of the FFIT framework, in turn partly achieved because of the flexibilization of the exchange rate (Taylor, 2000). When inflation is under control and the monetary authorities are credibly committed to keeping it low, firms have less incentive to pass through higher costs in the form of higher prices, given the countervailing actions that the Central Bank will take and the belief that inflation will remain stabilized.

Figure 9. One Year Pass-Through Coefficients
(Percent)



Source: Update of García and Restrepo's (2002) rolling linear regressions with a fixed starting point in January 1994 of annual inflation on annual exchange rate depreciations and a trend variable.

6. Final Remarks

Although it is too soon for a complete evaluation of the FFIT + Flex exchange rate regime that has been in place during the past five years in Chile, the results appear promising. The economy has managed to adjust to unfavorable conditions without major distress. Inflation has been well under control, the RER has adjusted substantially to the new environment, and monetary policy has managed to be markedly counter-cyclical. Of course, these are not solely the results of the monetary policy/exchange rate regime. Fiscal policy, financial regulation and supervision, and the functioning of capital markets have contributed as well. Overall, one can conclude that this macroeconomic framework, particularly the exchange rate regime and the fiscal policy rule, gives more stability to the Chilean economy. Periods of extreme booms or recessions are tempered by letting the exchange rate float.

An important feature of Chile's experience with floating has been increased exchange rate volatility, although it is in line with the international evidence for other floaters. Moreover, higher volatility is not only the result of letting the exchange rate fluctuate. Mature floaters with commodity based exports, such as Canada, New Zealand and Australia, have also experienced increased volatility in the past decade. Therefore, we cannot distinguish whether this is an international phenomenon of high volatility or a result of floating. Importantly, Chile has a well-developed derivatives market, enhanced by the floating regime, which allows firms to insure against exchange rate movements.

We have argued that exchange rate flexibility has made the inflation target more credible, and it has enhanced hedging by the private sector and therefore decreased the fear of floating. We have documented that although the exchange rate is certainly more volatile in the short run, it has had less extreme valuations than in the past. Furthermore, in this framework pass-through coefficients have declined. However, the strong credibility that the regime enjoys is not something that the framework can buy mechanically by itself. It reflects many years of prudential macroeconomic management in Chile and, possibly, the payoff for the bold commitment to objectives that the Central Bank showed during the 1998 episode. Indeed, adopting a flexible exchange rate regime in Chile has been possible thanks to many years of sound macroeconomic policies and a strong financial system. Rather than seeing this as a viable option that can be replicated always and everywhere, the Chilean experience has been one of gradual transit, on firm ground, toward flexibility.

Does the Chilean experience imply that countries should be fully open to capital controls and to letting the exchange rate float? It is clear that extending the Chilean experience to other countries is unwarranted. Strong institutions are a necessary condition for taking advantage of both a gradual opening up of the capital account and, later on, financial integration. Indeed, recent research has shown that gains from financial opening are difficult to find, but countries with strong institutions do obtain them (Prasad et al., 2003). Countries with weak institutions are more prone to crises and distortions arising from financial integration. In Chile, basic institutions to support financial integration are in place. There is a strong financial system, an independent central bank in charge of achieving price stability, and sound fiscal policy.

Similarly, in order to be able to let the exchange rate float freely, it is necessary to meet some conditions to overcome the fear of floating. Balance sheet effects of exchange rate

fluctuations must be limited; in addition, a credible anti-inflation stance is important to reduce the pass-through of exchange rates to prices in order to effectively target inflation. That Chile meets these conditions has been key in truly maintaining a floating exchange rate.

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