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

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Preliminary draft, comments are welcome

1. Introduction

Since 1999 the Central Bank (CB) of Chile’s policy framework includes a full-fledged inflation-targeting (FFIT) regime and a floating exchange rate (ER) regime whereby the CB 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 CPI-indexed) interest rate as a reference for monetary policy starting in 2001. Furthermore, this monetary framework has been actively supported in the fiscal front by a 1% structural surplus rule\(^1\) 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 ER developments. It first revisits the environment in which the flexible regime was adopted, including an ER policy based on target bands and capital controls. Then it describes the structure of the current dual IT–flexible ER framework and briefly evaluates its performance. Next, it describes how the framework has worked in practice under specific ER developments. In particular, it reviews how monetary policy (MP) is supposed to react to ER news and how it has actually reacted in specific episodes. With the same objective, it also revisits the logic behind interventions, including what is understood as exceptional circumstances, how have actual interventions been implemented and their effects. A discussion follows on three important issues related to ER policy, namely the costs, benefits and implications of ER volatility, the development of hedges, and the behavior of the passthrough. It ends with a few final remarks.

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\(^1\) A rule aimed at maintaining a fiscal surplus equivalent to 1% of GDP measured on a structural basis.

In this paper we show that the flexible ER 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 being most of the time within the target of 2 to 4%, and medium term expected inflation being anchored at the center of the band, which evidences the credibility of the IT regime. Despite a turbulent external environment in recent years, the floating of the Chilean peso has helped the adjustment, while MP has been clearly countercyclical. There has been an increase in ER volatility, something that should be expected with the flexibilization of the ER. However, the increase in volatility has also happened in other small open economies well endowed with natural resources that have been floating for a long time (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, there have been important developments in the derivatives market and a reduction in the pass-through from ER to inflation, factors that strengthen the credibility and feasibility of the float.

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

The current policy framework, in particular ER flexibility, was adopted after repeated problems with exchange rate rigidity. Although rigidity allowed certain stability, at the end such stickiness has been at the center of economic turmoil in Chile, 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. It had an implicit objective of promoting a depreciated real exchange rate (RER) that could stimulate exports, helping the post 1982 recovery, and generate 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 eighties were followed by revaluations in the nineties, when the equilibrium RER objective was either modified or harder to aim at because of significant pressures to appreciate it. Indeed, capital inflows were large during most of the nineties, international interest rates were low, while domestic rates were high, and there was a renewed interest of international investors in Latin America, and especially Chile after a period of high growth initiated in 1985.

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3 23.7% in September 1984, 9% in February 1985, and 5% in June 1985.
On top of realignments, the exchange rate band was widened several times, from ±2% to ±5% in mid 1989, to ±10% in January of 1992 and to ±12.5% in January 1997 (figure 1). Despite the apparently wide band, the nominal exchange rate was frequently at its floor during the nineties, materially constraining the degrees of flexibility of monetary policy. The CB had to constantly intervene in the market to support the band. Still, the widening band and interventions within it, where unable to contain the large peso appreciation of the nineties. During 1990-97 the real exchange rate appreciated at an average annual rate of 5.4%, accumulating a decline of 32% (figure 2).

The pressures to appreciate the currency drastically vanished with the Asian crisis. The depreciation was fought with forex interventions and tight monetary policy. In January and then again in 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). Additionally, the band’s width was...
radically squeezed to curb depreciation expectations: from ±12.5% around the center to 2% above and 3.5% below the target.5

Selective capital controls were used during the nineties as a way to obtain space of maneuver for MP 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 down from 30% to 10% and subsequently to 0%.6

Defending the currency obeyed 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 passthrough from exchange rate to inflation would have put in danger price stability. In addition, financial vulnerability arising from dollarized liabilities of the corporate sector and an excessive current account deficit put at risk the normal functioning of the payments system if the depreciation was large.

However, the credibility achieved by the narrowing band was very 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 was severely cut down. Additionally, world stock and commodity prices fell dramatically. Unsterilized interventions caused interest rates to soar.

By September 1998, after few months of defending the peso within the narrow band, the CB expanded it to ±7%, and announced a gradual widening plan for the months ahead, reaching 10% by the end of 1998 and 16% by the end of 1999. This move was combined with a tightening of monetary policy (the CPI-indexed MP rate was raised from 8.5% to 14%). In December 1998 the band was discretely widened to ±8%, and the gradual widening plan continued until August 1999, when it reached ±11.7%. The discount for foreign inflation in the central parity was eliminated, and the center of the band was made to crawl according to annual inflation target rather than to past inflation. This was the first step towards abandoning the ER objective and a further movement towards a FFIT.

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

As a luxury of analyzing with hindsight, it is tempting to think that the flexibilization of the ER could have been done sooner. The perceived costs of doing so were probably overstated as price and financial instability would have probably been less than expected. Passthrough and corporate mismatches were low, and the derivatives market had developed

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5 Céspedes et al. (2004) analyze the Chilean policy response after the Asian crisis and compares 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).
Moreover, the falling costs of floating would endogenously respond to the float and fall even further. Flexible ER would motivate further development of the derivatives market and the adjustment of mismatched firms. A credible commitment with the inflation target would reduce ER passthrough to prices (Campa and Goldberg, 2001; Choudhri and Hakura, 2001; Gagnon and Ihrig, 2001). Additionally, it 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 (Eichengreen and others, 1998 and 1999), which supports the point in favor of not wanting to increase instability in an already unstable situation. Moreover, it is only the involuntary ER regime changes that cause worse growth, inflation and ER 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 of 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.

As is well known, capital controls may allow having an independent monetary policy with some form of exchange rate targeting. This was actually the route chosen in Chile during the nineties, and, because of the very good performance of the Chilean economy during that period, it has been the subject of important effort of academic research as well as policy discussions. Indeed, for many observers, at the core of Chile’s success were capital controls. We dispute this view, by arguing that the role of capital controls was not central, not to blame for problems either, and most of the tensions regarding capital flows were due to rigidities in the exchange rate system. There is no way to do the counterfactual of what would the 90s have been like without controls and with a fully flexible exchange rate. However, the empirical evidence is abundant, and the results show very limited effects of capital controls.

Most of the studies have found no effect on the total volume of capital flows, and 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. Furthermore, there is evidence that countries with fixed and intermediate exchange rate regimes (as opposed to flexible

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7 Indeed, De Gregorio and Tokman (2004) document that all conditions to float were met before the Asian crisis.
8 See De Gregorio et al. (2000) for 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 also would affect capital flows and the exchange rate. However, the evidence shows that the effects on interest rates are small and short-lived, and hence its 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 argue why interest rates effects did not affect the exchange rate. This is not a surprise since effects of the URR on interest rates were small and hence they explained little of exchange rate movements.
ones) experienced larger inflows during the 90s 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 to capital flows, what lies at the center of experiences with large capital inflows.

Finally, it should be stressed that capital controls in the nineties did not prevent the attacks on the Chilean peso in 1998. Still, perhaps the most persuasive evidence on the limited effects of capital controls comes from Chile’s experience with the crisis of 1982, when the exchange rate was fixed and capital controls on short-term flows were stricter—in fact, they were not allowed. The external debt was mostly long term. These controls did not prevent the collapse, which in the context of a weak financial system did not only cause a currency crisis, but also a large banking crisis. It was a combination of a fixed-exchange rate and weak financial supervision what caused the collapse; capital controls played a secondary role.

3. The Current Policy Framework: FFIT + Flex ER

**Full-Fledged Inflation Targeting**

The current IT framework is the result of ten years of gradual convergence to industrialized countries’ inflation levels, a process that was based on annual announcements every September of the subsequent year’s December/December CPI inflation target. This successful slow convergence process was implemented within a regime that had many similarities to what today is known as IT, although also some differences (Morandé, 2002). The most important difference is 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 MP would have no almost effect on the achievement of the target. In addition, 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 IT regime was adopted, with December 2000 as the date in which the new regime was supposed to be fully operative. The permanent inflation target was set as a 2 to 4% band, centered in 3%, for annual (yoy) CPI inflation.

Considering the lags of MP to influence inflation, and also that it would be too costly in terms of output volatility (and interest rate volatility) to counteract once and for all price shocks, the monetary policy decisions have as the relevant horizon the following 12 to 24 months. In practice, this means that the 12-24 month horizon forecasts are the operational objective for the CB; if it substantially diverges from 3%, 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.

This forward-looking nature of the framework implies that MP could in certain circumstances need to be adjusted even when current inflation is 3% or, alternatively, that transitory shocks may not need any MP 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% band are possible and accepted, but only if it is expected with relative certainty that inflation will be back around 3% 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 is inflation expected 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 IT target is symmetric, which implicitly penalizes positive and negative deviations from the band equally.

The key IT 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 IT framework. It allows the CB to be both more accountable and more efficient in its conduct of MP. Accountability is a central piece of CB independence, whereas MP efficiency is highly desirable to enhance the benefits and limit the possible costs of MP in terms of both inflation and output volatility.

The framework has the standard instruments for communicating the rationale of policy decisions, namely: (i) A Monetary Policy Report every four months which includes an evaluation of recent developments and detailed forecasts for both output and inflation. It is presented to the Senate of the Republic and in several places afterwards; (ii) Communiqués made public right after each monthly monetary policy meeting that briefly informs the rationale of the decision; (iii) Detailed minutes containing the monetary policy meeting analysis, including data and evaluation of policy options, published one week before the subsequent monetary policy meeting (thus, on average, three weeks after the meeting that it makes reference too); and (iv) Public speeches by Board members and senior staff.

A brief evaluation of the IT regime shows that, at least so far, it has served well the Chilean economy. To begin with, its infant stage allowed a gradual decline in inflation starting in 1991. Inflation dropped from almost 30% per annum to less than 5%. Afterwards, since the announcement of the permanent target, inflation has averaged 2.7% between January 2000 and March 2005, with a peak of 4.7% and a trough of –0.7%. During the same period, inflation has been between 2 and 4% two thirds of the time (see figure 3).

Secondly, the IT framework has endowed the economy with a strong nominal anchor. Different measures of expected inflation show that the number 3% appears to be an attractor for longer run forecasts. For instance, the CB monthly survey shows that two years ahead expected inflation is seldom different from 3%. The implicit inflation compensation that can be calculated from same maturity CPI-indexed and nominal CB bonds (with amounts to the sum of expected inflation plus unknown and variable risk premium) also tends to revert to 3% (see figure 4).
Also, MP in Chile has been strongly counter-cyclical throughout the full IT 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 MP 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.\(^{10}\)

\[\text{Figure 3. CPI Inflation and Inflation Target}\]

\[\text{Source: Central Bank of Chile.}\]

\[\text{Figure 4. Expected Inflation Measures}\]
\[(\text{CB nominal bond inflation compensation and surveys, percentages})\]

\[\text{Source: Central Bank of Chile.}\]

\(^{10}\) For the period in which MP 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 CB survey.
The Flexible Exchange Rate Regime

A flexible ER regime is consistent with the IT 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 IT would become the only focal point as an anchor only if the ER was allowed to float.

Together with letting the peso float, the Central Bank of Chile reserved the right to intervene. The monetary authority has sustained 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 ER market may be desirable.\(^\text{11}\) It has also declared, consistently with the aim to be transparent, that, should such circumstances occur, it will make it public by telling the market why it believes an intervention is called for.

A brief evaluation of the almost five years of operation shows that the flexible regime has also served well the economy. First, the floating regime has been crucial in allowing the CB run an independent monetary policy aimed mainly at the inflation target, but that could also be used as a stabilization tool. In fact, as was shown above, since the ER was let to float, the CB has followed a strong countercyclical MP, more marked than during the nineties.

Second, as is well known, ER flexibility is clearly desirable in economies that are frequently exposed to real shocks, like 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 ER adjustment channel does not operate. Thus, under a floating regime, the ER 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).

Table 1. Selected Indicators.

<table>
<thead>
<tr>
<th></th>
<th>RER (1986=100)</th>
<th>Copper Price (dollars/lb)</th>
<th>Latin American EMBI</th>
<th>Trading Partners’ Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>90s</td>
<td>92.0</td>
<td>1.009</td>
<td>771 (1)</td>
<td>3.1%</td>
</tr>
<tr>
<td>2000</td>
<td>86.0</td>
<td>0.823</td>
<td>665</td>
<td>3.8%</td>
</tr>
<tr>
<td>2001</td>
<td>95.8</td>
<td>0.715</td>
<td>867</td>
<td>1.6%</td>
</tr>
<tr>
<td>2002</td>
<td>96.9</td>
<td>0.707</td>
<td>965</td>
<td>1.9%</td>
</tr>
<tr>
<td>2003</td>
<td>104.3</td>
<td>0.807</td>
<td>700</td>
<td>2.8%</td>
</tr>
<tr>
<td>2004</td>
<td>99.3</td>
<td>1.300</td>
<td>527</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Source: Central Bank of Chile.
(1) average for 1998 and 1999 only.

And 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 it with certainty, it is interesting to notice that, contrary to what was the norm in the 90s, domestic demand has not reacted briskly and disorderly to abnormally advantageous conditions in the most recent past. In addition to the strong fiscal performance, the contribution of the ER regime to this better 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 ER front. First, MP could be adjusted if the new information modifies the expected path of inflation. And second, news may trigger an intervention policy under exceptional circumstances, when the Board evaluates there may be adverse economic effects of an overreacting exchange rate.
Exchange Rate and Monetary Policy Reactions

As for inflation forecasts and MP, the evaluation can be separated into two main steps. The first one is the likely path of the exchange rate under the assumption that the policy path is unchanged. The second one is the evaluation of the inflation effect of this new ER path.

As for the ER path, the standard benchmark is to assume the existence of uncovered interest rate parity (including both country and exchange rate risk premium) and some estimate of the “long run” equilibrium exchange rate. News on the exchange rate, therefore, can 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, this means that, more often than not, exchange rate movements are treated as persistent (or even permanent).

One especially interesting case is 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 that these differences cannot be accounted for by interest rate differentials. In that case, it is possible to assume a future reversion of the exchange rate to “equilibrium levels”. At the CB, 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. A key “reduced form” parameter to measure the impact of exchange rate innovations on inflation is the passthrough coefficient—the ratio between changes in the nominal exchange rate and the CPI at different horizons. The core model has a passthrough coefficient of roughly 20% in one year, 25% in two years and peaks at 30% in three years. These numbers are substantially smaller than the perceived passthrough coefficient a few years ago (more on this below). After this two-step evaluation, the CB Board analyses the most appropriate MP 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 MP policy reaction. These two episodes show that there is no mechanical relationship between exchange rate movements and the MP interest rate. Both times the MP was loosened, but in one case with an 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%. In the September 2003 Monetary Policy Report, just at the beginning of this ER shift process, inflation forecasts assumed a “slight real peso appreciation over

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12 Details on the mechanics embedded in the CB core model can be found in Central Bank of Chile (2003).
the projection horizon”. Four months later, the January 2004 Report begins by recognizing that inflation “fell significantly and unexpectedly because of surprisingly low cost pressures”. Inflation was 2.9% in August 2003 and 0.8% in January 2004. One key driver of these lower cost pressures was the peso appreciation, deemed as “surprisingly fast and considerably greater than expected”. The new forecasts assumed that “the peso will remain stable [...] over the projection horizon”. The MP policy reaction was to cut interest rates by 100 basis points to 1.75% (50 pb in both the December and January MP meetings). Interestingly, the forecast of average CPI inflation for 2005 dropped from 3% to 2.7% even after that. The output growth forecast for 2004 increased between reports from a 4 to 5% range to a 4.5 to 5.5% range. The CB defended the MP changes as being necessary to reduce the risk of inflation falling below the target for too long and thereby delaying inflation’s return to 3%.

An earlier episode, this time without triggering an evident MP reaction, happened during part of 2002. Between May and September 2002 the real exchange rate increased (the peso depreciated) by more than 10%. However, over the same period, interest rates were cut by 125 bp. The average inflation forecast for 2003 was 2.8% in May and 3% in September, whereas forecast output growth dropped from 5.8% in May to a 3.5 to 4.5% range in September. The movements of the exchange rate were understood as the reaction to the interest rate differentials (in fact, a 2% appreciation was part of the baseline scenario assumptions in September) and the deterioration of external conditions, both in terms of regional financial conditions and global output growth. The ER reaction was understood as being part of the adjustment process—the natural reaction of the floating regime to the external outlook probably amplified by the MP reaction to this worsening environment—and positive to sustain export growth.

**Exchange Rate and Interventions**

As for reactions through intervention in exceptional circumstances, the CB 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. An overreaction of the ER could require movements in the MP 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 during periods of turmoil to inflation before adjusting MP. For example, a sharp depreciation could generate inflation that would be necessary to compensate with MP tightening. But if the exchange rate movement was 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 to 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 will bring inflation. This inflation, in turn, will validate an initially excessive depreciation. Before tightening monetary policy it could be advisable to

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

intervene. However, a central bank has to be careful in intervening because it may be tempted to fight inflation with ER misalignment, a clear recipe for disaster. For this reason, to avoid becoming addicted to intervention, the CB has decided to be transparent, to justify fully the reasons to intervene, and in practice define a clear timeframe and maximum magnitude for the intervention.

The CB has explicitly recognized that detecting an exchange rate overreaction or overshooting is not an easy task. Even in cases where there is no full certainty that there is an overreaction, it may be advisable to intervene. In some occasions such interventions may be ineffective, but the cost of intervening outweighs the expected costs of unjustified turmoil.

At the end, determining exceptional circumstances or whether the exchange rate is overreacting is a judgmental call of the CB Board. However, it is an informed call grounded on a thorough analysis based on different perspectives. Ways of classifying these 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.

To this day, since the adoption of the flexible ER 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). 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 ER and Intervention Periods.

![Figure 6](image_url)

Source: Central Bank of Chile.

\[15\] For details, see De Gregorio and Tokman (2004).
In both cases, alternative measures of RER and misalignment measurements revealed an atypically undervalued peso. The instruments used by the CB 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 MP tightening when the economy was slowly starting to recover and the output gap still was large.

The approach to intervention was very transparent—announced, fixed length, maximum amounts—in line with interventions affecting the ER through expectations (what is commonly known as the signaling channel), which change only if it is perceived that the central bank is doing something. That is, if it is actively intervening or if it is 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 most effect on ER. They find that the effect was immediate (as can be seen in the figure), even before any spot or dollar indexed bond sale occurred. Additionally, they find that the announcement of an “exception period” produced a change in the ER 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; Hansen 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 IT 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 ER market. During the 2001 intervention episode, US$803 million were used in spot interventions16 and US$3 billions in dollar-indexed bond sales (including the regular rollover program). During the 2002-2003 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 ER was greater on the first intervention period than on the second one, summing appreciations of 3.9% vs. 2.1%, respectively17. On the other hand, 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 on the first period than in the second. However, 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.

16 Less than half the initially announced maximum amount.
17 Although it had accumulated a depreciation of nearly 5% in September 2001, primarily because of the effects of the September 11 terrorist attacks, and an appreciation of 8.8% by December 2002, before the intervention strategy was redefined.
5. Issues: Volatility, Hedging, Extreme Valuations and Passthrough

One of the most important shortcomings of flexible exchange rates is that they are more volatile than other regimes. Changes in financial conditions will result in immediate changes in the ER. Moreover, the exchange rate may fluctuate even more than fundamentals (i.e. 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 large basis of natural resources such as Australia, Canada, South Africa and New Zealand, had higher volatility in recent years compared to the 90s, despite they were already floaters by then.18

![Figure 7. Currency Volatility](image)

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

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18 South Africa had a few years in the nineties where multiple ER regimes were in place. But for most of that decade, the ER was floating.
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 that the band itself was not seen as a completely free insurance. The commitment with 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 and motivated firms and banks to reduce exposure and cover from ER risk. Local companies with international trade operations or foreign exchange exposure of liabilities in their balance sheets demanded hedging instruments, driving to the development of the foreign exchange derivatives market even before the float, but more importantly after it, when subscriptions of forex derivatives more than doubled in five years (table 2). Furthermore, with the new regime there has been an increasing use of other instruments such as forex swaps and cross currency swaps, while the traditional instruments kept growing in size. Across emerging countries, Chile’s total turnover (as of April 2004) in spot, forward and forex swaps is relatively high (8% of GDP), much higher than the 5.8% found for the 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 ER 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 17bp (see Alarcón et al., 2004).

### Table 2. FX Derivative Market in Chile

<table>
<thead>
<tr>
<th>Year (December)</th>
<th>Local Market (million of dollars):</th>
<th>Turnover as % of:</th>
<th>% firms with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreign</td>
<td>Total</td>
<td>GDP</td>
</tr>
<tr>
<td>1993</td>
<td>2,822</td>
<td>2,822</td>
<td>0.06</td>
</tr>
<tr>
<td>1994</td>
<td>9,415</td>
<td>9,415</td>
<td>0.18</td>
</tr>
<tr>
<td>1995</td>
<td>21,124</td>
<td>21,124</td>
<td>0.32</td>
</tr>
<tr>
<td>1996</td>
<td>47,828</td>
<td>47,828</td>
<td>0.63</td>
</tr>
<tr>
<td>1997</td>
<td>112,050</td>
<td>112,050</td>
<td>1.35</td>
</tr>
<tr>
<td>1998</td>
<td>112,150</td>
<td>112,150</td>
<td>1.41</td>
</tr>
<tr>
<td>1999</td>
<td>125,494</td>
<td>125,514</td>
<td>1.72</td>
</tr>
<tr>
<td>2000</td>
<td>139,228</td>
<td>150,874</td>
<td>2.01</td>
</tr>
<tr>
<td>2001</td>
<td>143,192</td>
<td>163,500</td>
<td>2.39</td>
</tr>
<tr>
<td>2002</td>
<td>130,686</td>
<td>161,101</td>
<td>2.39</td>
</tr>
<tr>
<td>2003</td>
<td>165,835</td>
<td>207,427</td>
<td>2.88</td>
</tr>
</tbody>
</table>

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 ER system the cost is borne out by the government or the central bank,

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.
while under floating the cost is paid by the private sector. 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 is what justifies some intervention in exceptional periods; but it is difficult to find an argument in favor of the optimality of eliminating volatility when the markets for hedges 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 a 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 periods of low volatility, but of persistent misalignment. More generally, one can think of the probability of having extreme valuations as an important characteristic of an ER 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 be away from the long-run equilibrium, 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 uses as a measure of the long-run equilibrium 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 bequested misalignment 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 in managing a severe currency crisis. The next periods include the narrow ER band from 1984 to 1991, the wider band from 1991 to 1999, and the float from 1999 up to the present day.

Table 3. RER Misalignment in Chile: 1979-2004

<table>
<thead>
<tr>
<th>Residuals</th>
<th>HPLow</th>
<th>HPHigh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of Squared Missalignment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tablita + Fixed (79.I - 82.II)</td>
<td>24.7%</td>
<td>31.0%</td>
</tr>
<tr>
<td>Narrow band (85.II - 91.IV)</td>
<td>8.4%</td>
<td>21.5%</td>
</tr>
<tr>
<td>Wider band (93.I - 99.III)</td>
<td>9.9%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Float (00.IV - 04.IV)</td>
<td>10.7%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

Maximum Undervaluation

<table>
<thead>
<tr>
<th>Residuals</th>
<th>HPLow</th>
<th>HPHigh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablita + Fixed</td>
<td>5.1%</td>
<td>*</td>
</tr>
<tr>
<td>Narrow band</td>
<td>16.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Wider band</td>
<td>3.9%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Float</td>
<td>22.6%</td>
<td>15.7%</td>
</tr>
</tbody>
</table>

Maximum Overvaluation

<table>
<thead>
<tr>
<th>Residuals</th>
<th>HPLow</th>
<th>HPHigh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablita + Fixed</td>
<td>-41.6%</td>
<td>-41.3%</td>
</tr>
<tr>
<td>Narrow band</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Wider band</td>
<td>-19.4%</td>
<td>-16.8%</td>
</tr>
<tr>
<td>Float</td>
<td>-2.8%</td>
<td>-3.3%</td>
</tr>
</tbody>
</table>

Source: Author’s calculation.
* During this regimes there were no under(over) valuations.

The table 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 resemble more 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 to the others. Only the narrow band period shows a persistent undervaluation, but this was largely due to the lack of access to international financial markets. This resulted in a significantly depreciated real exchange rate, but 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 allows prompt adjustment to changing external and domestic conditions.
The international evidence also supports the view that a flexible ER regime has a better chance of tracking better the equilibrium ER. The square of the misalignments for fixed, intermediate and floating regimes, for a sample of 60,\textsuperscript{20} show that indeed the lowest deviations happened in countries with flexible exchange rates, and the highest in intermediate regimes (figure 8). Although one could 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.](chart.png)

Source: Authors’ calculations based on Aguirre and Calderón (2005) and Reinhart and Rogoff (2003).

Finally, it is interesting to notice that although the floating regime has increased ER short run volatility, its weight in determining inflation has apparently declined substantially. Compared to historical values, passthrough coefficients were low when the peso was allowed to float, and has been falling ever after (figure 9). For instance, in 1999 the CB considered this coefficient to be 50% for a one-year horizon and even 70% in an overheated economy, such as Chile in 1997 (Central Bank of Chile, 1999).

Although lower passthroughs 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 ER (Taylor 2001). When inflation is under control, and the monetary authorities are credibly committed to keeping it low, firms have less incentives to passthrough 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.

\textsuperscript{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 Reinhart and Rogoff classification) that was in place for more than half of each window (3 of 5 years).
6. Final Remarks

Although it is too soon to have a complete evaluation of the FFIT + Flex ER regime that has been in place during the past five years in Chile, the results appear promising. The economy has managed to adjust to quite unfavorable conditions without entering into major distress. Inflation has been well under control, the RER has adjusted substantially to the new environment, and MP has managed to be markedly countercyclical. Of course, these are not solely the results of the MP/ER regime. Fiscal policy, financial regulation and supervision, and the functioning of capital markets, have contributed their part. Overall, one can conclude that this macroeconomic framework, particularly the ER 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.

One important feature of Chile’s experience with floating has been increased ER 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 like Canada, New Zealand and Australia, have also experienced increased volatility in the last decade. Therefore, we cannot distinguish whether this is an international phenomenon of high volatility or a result of the floating. Importantly, Chile has a well-developed derivatives market, enhanced with the floating regime, which allows firms to insure against exchange rate movements.

We have argued that ER flexibility has made the IT more credible, and it has enhanced hedging by the private sector and therefore decreased fear of floating. Also, we have documented that although the ER is certainly more volatile in the short run, it has had less extreme valuations than in the past. Furthermore, in this framework passthrough 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 with its objectives that the CB 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 grounds, toward flexibility.

Does the Chilean experience imply that countries should be fully open to capital controls and to let the exchange rate float? Definitely, extending the Chilean experience to other countries is unwarranted. Strong institutions are a necessary condition to take 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., 2004). 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 also necessary to meet some conditions to overcome 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 passthrough of exchange rates to prices in order to effectively target inflation. Chile meets these conditions which have been key to truly maintain a floating exchange rate.
References


Central Bank of Chile (2003) *Modelos Macroeconómicos y Proyecciones del Banco Central* de Chile, Banco Central de Chile.


