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Abstract[*]

This paper reviews the recent experience of a half-dozen Latin American inflation targeting (IT) nations. Repeated and large deviations from the standard IT framework are documented: exchange market interventions have been lasting and widespread; the real exchange rate has often become a target of policy, though this target is seldom made explicit; a range of other non-conventional policy tools, especially changes in reserve requirements but occasionally taxes or restrictions on international capital movements, also came into common use. As in developed nations, during the 2008-2009 crisis issues of liquidity provision took center stage. A first evaluation of the emerging modified framework of monetary policy is also attempted. In general terms, the new approach seems to have been effective, at the very least since the region weathered the crisis reasonably well. But also, and perhaps more importantly, many questions remain about the desirability of non-conventional monetary policies in Latin America.

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1. Introduction

Is inflation targeting still on target? The system has served many countries well over the last couple of decades, but changes may be desirable—perhaps inevitable—if IT is to be just as useful in the next decade or two. That, at least, is what the recent experience of several developed and emerging economies suggests.

The reaction to the recent financial crisis has involved repeated and large deviations from the standard IT framework. This paper reviews the recent experience of a half-dozen Latin American inflation-targeting nations and concludes that some of those deviations may be here to stay.

A simple summary of received wisdom on what IT should do might go like this: i) inflation is the main (perhaps the only) target of monetary policy; ii) authorities use the short interest rate (both its current setting and announcements about its future course) to achieve their inflation target; and iii) the exchange rate floats freely.

In addition, according to prevailing wisdom liquidity and prudential concerns belong in the monetary framework, but more in the background than in the foreground. This is because the conventional view assumes that other (i.e., non-monetary) tools are better suited for dealing with prudential issues.

In the recent experience of rich and not-so-rich inflation targeting nations, most of these precepts were thrown out of the window most of the time. In developed countries, the one-target, one-instrument approach came to an abrupt end: liquidity and prudential concerns took center stage and a vast array of non-conventional tools became key to the monetary policy toolkit. Some developed countries—though not all—intervened in currency markets in order to control the nominal exchange rate.

In emerging markets (EMs) an analogous transformation took place. Exchange market interventions have been lasting and widespread, even in countries such as Chile where monetary authorities had made vows to let the currency float freely. In many EMs the real exchange rate has often become a target of policy, though this target is seldom made explicit. Moreover, a different range of non-conventional policy tools—especially changes in reserve requirements for bank liabilities of varying maturities and currency denominations, but occasionally also taxes or restrictions on international capital movements—also came into common use. Finally, as in the developed nations, during the 2008-2009 crisis issues of liquidity provision took center stage.

In this paper we analyze the experience of six countries: Brazil, Chile, Colombia, Mexico, Peru and Uruguay. We find that all these inflation-targeting nations deviated from the standard framework, though in different ways and using different instruments. A major objective of the paper is to document *what* these countries did, and understand *why* they did it.

Based on those experiences, in this paper we attempt a first evaluation of the emerging modified framework of monetary policy. We find that in general terms the new approach was effective, at the very least since the region weathered the crisis reasonably well. But perhaps most important, we find that a number of questions remain as to whether these are optimal policies, and under which conditions they might be expected to yield desirable results.

The next section provides a conceptual framework for understanding the standard components of inflation targeting and also the possible deviations from that standard policy stance. The section after that documents the shocks and policy responses in the six countries considered. A final section aims to extract lessons from these experiences and understand *whither* monetary policy in Latin America.

2. A Conceptual Framework

In this section we review the conceptual framework behind inflation targeting. We begin by revisiting the canonical model used to justify the approach. We then highlight a number of deviations from the standard set of assumptions that in turn may call for a modified or enlarged inflation targeting policy.

2.1 The Canonical IT Framework

The canonical framework behind inflation targeting has been most convincingly developed by Svensson and Woodford (see Svensson, 1999; Svensson, 2010; Svensson and Woodford, 2005; Woodford, 2003). Svensson (1999) considers a central bank that at some time T is instructed to minimize a loss function of the form

$$E_T \sum_{s=0}^{\infty} \beta^s L_{T+s}$$

where L_t is a period loss function. Often, the loss function is assumed to depend on inflation π_t and the output gap $\tilde{y}_t$, say, and to be quadratic, as in

$$L_t = \pi_t^2 + \theta \tilde{y}_t^2$$

where θ is a parameter indicating the relative importance of inflation and the output gap in the loss function. This is one formulation but certainly not the only one. More generally, L_t can be assumed to be a quadratic function of a *target* vector Y_t.

Svensson assumes that the central bank is constrained by the law of motion of the economy, assumed to be linear:

$$\begin{bmatrix} X_{t+1} \\ E_t x_{t+1} \end{bmatrix} = A \begin{bmatrix} X_t \\ x_t \end{bmatrix} + B i_t + \begin{bmatrix} v_{t+1} \\ 0 \end{bmatrix}$$

where i_t is the policy instrument (typically an overnight interest rate), x_t a vector of jumping variables, X_t a vector of states, v_t an i.i.d. sequence of shocks, and A and B are matrices.

In this setup, Svensson (1999) showed that the optimal policy is given by a system of equations of the form:

$$G_T(Y_T, E_T Y_{T+1}, E_T Y_{T+2}, ...) = 0$$

This system can, in principle, be solved for $Y_T, E_T Y_{T+1}, E_T Y_{T+2}, ...,$ thus yielding an optimal expected path for the target variables. Then the current and future expected values of the policy instrument, $i_T, E_T i_{T+1}, ...$ can be derived. Svensson (1999) called this solution *inflation forecast targeting* and argued that it resembles actual IT implementation, in which central bankers periodically announce projections for their policy instrument and the resulting expecting path of the economy.

An important implication of the solution is that any variable not included in the target vector Y_t can affect the setting of the policy instrument i_t if it affects the expectation of the target variables. In addition, this is the *only* way in which such a variable can affect optimal policy.

It is crucial for the analysis, therefore, to justify the form of the central bank's loss function L_t, and in particular to determine what variables "should" be included in the vector of targets Y_t. The current approach to this question is based on the work of Woodford (2003), who showed that, in the context of a canonical New Keynesian framework, the lifetime utility of the representative agent can, under some conditions, be locally approximated with a quadratic

function of the inflation rate and the output gap. This result, in fact, then implies that zero inflation is optimal since, under the same maintained assumptions, the aggregate supply function depends only on inflation and the output gap, so that zero inflation is also consistent with a zero output gap. This can be, hence, interpreted as saying that an IT system (with a target of zero inflation) is optimal.

Finally, in the canonical New Keynesian model, control of the policy interest rate allows the central bank to choose a point in the inflation-output gap tradeoff given by the aggregate supply equation. The central bank can, in fact, set the interest rate so as to make inflation and the output gap both zero. This can be used to justify the view that the *conventional policy*, which consists of controlling a policy interest rate, is sufficient for optimality in an IT regime.

2.2 Departures from the Conventional Wisdom

Both Svensson and Woodford assumed that the central bank chooses policy at T with perfect commitment. In the absence of commitment, the usual time consistency problem of monetary policy appears. In fact, the possibility of time inconsistency provides a different justification for inflation targeting. From this viewpoint, IT can be seen as a commitment mechanism that, in Barro-Gordon style, eliminates the *inflationary bias* of monetary policy (Woodford has also mentioned and developed this point). While the question of how IT is in fact an effective response to time inconsistency seems to be faded from academic work, much of the actual rhetoric justifying IT owes a great deal to this issue. The often-heard argument that IT "enhances credibility and transparency" should be interpreted in this light.

While the Svensson-Woodford framework delivers clear cut and stark support for targeting inflation at zero and the conventional policy of setting an interest rate, extensions of the basic New Keynesian model easily lead to qualifications of that prescription:

Cost Push Shocks*:* If the aggregate supply schedule linking inflation and the output gap is hit by an exogenous shock, then it is generally impossible for the central bank to set its policy rate so as to make inflation and the output gap simultaneously zero. Optimal policy, then, usually requires some inflation and a non zero output gap, with both fluctuating over time. (This point is developed, e.g., by Gali, 2008).

An alternative possibility, not considered in the literature, is that the central bank could be endowed with a second policy instrument, which together with conventional interest rate management could restore its ability to deliver both zero inflation and a zero output gap.

The loss function*:* In Woodford's basic framework, the fact that the welfare of the representative agent can be approximated by a function of inflation and the output gap depends crucially on the details of the basic New Keynesian model. Ultimately, the representative agent's welfare depends on consumption and labor effort; in the New Keynesian model, roughly speaking, a nonzero output gap indicates a suboptimal tradeoff between consumption and labor, while nonzero inflation leads to price dispersion, which is costly because symmetric goods are produced in different quantities. This suggests that modifications of the economy's structure may imply that inflation and the output gap may not suffice to summarize how economic equilibrium affects the welfare of the representative agent.

In this same line, Aoki (2001) showed that if a closed economy has two sectors, one subject to price rigidities and one that is not, then the correct approximation to welfare must include a relative price of the two goods in addition to inflation and the output gap. This result has been generalized by Woodford (2003), who identified the crucial assumption for Aoki's result in the difference in nominal rigidities across sectors. Woodford shows, in particular, that it is not necessary to include the relative price in the welfare approximation if the two sectors have the same degree of price rigidity.

Similar results have been obtained for the open economy, where the relevant price is an exchange rate and distortions other than nominal price rigidities appear naturally. Following Corsetti and Pesenti (2001), in many models a central bank has the ability to affect the relative world price of exports, which can raise national welfare (this is often called the "terms of trade externality"). This implies that an approximation to national welfare should include the real exchange rate or the terms of trade (e.g., De Paoli, 2009), reflecting the potential benefits of terms of trade manipulation.

More recently, Engel (2009) has emphasized that, if it is assumed that export prices are set in the currency of the buyer (the "pricing to market" case), deviations from the Law of One Price will occur, leading to inefficiencies. Consequently, a welfare approximation should include a term reflecting "exchange rate misalignment."

In short, there seem to be several plausible deviations from the standard setup in which a relative price such as the real exchange rate could enter the objective funcion. Again, this could conceivably lend theoretical support to the attempts to influence this relative price which, as we will document below, have been present in practically all the recent Latin American experiences.

Following along these lines, one might also ask whether financial prices or credit spreads should be included in the loss function. This question, which seems particularly relevant after the financial crisis, has recently attracted considerable attention. However, definitive results have been few and far between. The most notable effort is by Curdia and Woodford (2009), who modify a basic New Keynesian model assuming that agents could be "savers" or "borrowers" according to their marginal utility of consumption. The model also assumes a costly financial intermediation technology, which implies a positive and time-varying spread between borrowing and lending interest rates. The key new distortion, therefore, is that the spread results in a difference between the marginal utility of consumption of borrowers and savers. Curdia and Woodford show that this leads to a welfare approximation that depends on a measure of credit spreads.

In short, all of these papers suggest that the conventional loss function, which depends only on inflation and the output gap, may have to be modified to include additional variables (such as the real exchange rate or some credit spread). This, of course, weakens the case for the canonical IT framework. Yet it should also be mentioned that many of these papers find that basing policy on the conventional loss function, while not theoretically correct, leads to a good approximation of optimal policy under plausible parameterizations.

Transmission Mechanism*:* If, as in the Curdia-Woodford model, there are several interest rates, the question emerges as to which one is best assigned as the instrument of monetary policy. This question, of course, does not emerge in the canonical New Keynesian model, in which the policy rate is the one and only rate. The importance of the issue became patent during the recent crisis, in which several central banks lowered their policy rates to zero, only to see that other rates, such as bank lending rates, barely moved. This was taken to signal a breakdown in the "transmission mechanism."

In a sense, the essential issue is this: the basic New Keynesian model, or any model that features a single interest rate for that matter, is not the right model. If the central bank identifies

the correct model that accounts for different interest rates, presumably it could identify how policy should be adjusted to deal with such breakdowns in the transmission mechanism.

But the issue has additional facets. One of them is the existence and role of nonlinearities, a prominent example of which is the zero lower bound on interest rates. Another example is the interaction of financial frictions, collateral constraints, and asset prices, as developed recently in Gertler and Karadi (2011) and Gertler and Kiyotaki (2009). In these cases, the key problem is that the conventional policy instrument (an overnight rate) can in some cases become insufficient to steer the economy towards a desired path. This can justify the search for alternative, "unconventional" instruments.

Following this logic, Garleanu, Ashcraft and Pedersen (2010), study the effects of two monetary instruments: interest rates and haircuts, defined as the willingness by the central bank to accept collateral for loans on terms that are more generous than those prevailing in the market. They find that, if borrowing constraints take a certain form, this second instrument can affect asset prices and hence real allocations.

Again, this line of argument is reminiscent of the kinds of real-world policies to be documented below. Several non-conventional policies were justified precisely on the grounds that the transmission (or the arbitrage) mechanism had broken down and more direct interventions (for instance in the market for longer-term bonds) were called for.

3. Case Studies

In what follows we describe the main policy innovations adopted in each country, along with their results. Analysis and policy lessons follow in the final section.[1]

3.1 The Experience of Brazil

3.1.1 2007 to Lehman

Like other Latin American countries in our sample, at the start of 2007 Brazil was starting to experience a boom. Market doubts about the orientation of the Lula government, expressed in country risk spreads of more than 1,500 basis points in 2002, had completely disappeared by 2006. The Brazil EMBI spread (Figure B1), which had hovered around 400 bps during mid-

[1] The sources for the analysis presented in this section are monetary policy reports, annual reports, public statements of monetary policy meetings, official press releases, financial stability reports and central banks' databases.

2005, fell to about 200 bps by the beginning of 2007 and kept falling until the middle of 2007, when the global crisis started.

High interest rates had also kept activity in check and pushed inflation down. As seen in Figure B2, yearly CPI inflation closed 2006 at 3.14, exhibiting a clear downward trend. The continuation of the trend would have, in fact, brought inflation below the lower limit of the Central Bank's tolerance band centered at 4.5 percent, plus or minus 2 percent.

GDP growth in 2006 was 4 percent and accelerating. It would reach 6.1 percent in 2007 (Figure B3) Investment was strong and foreign capital inflows robust, leading to an appreciating exchange rate (Figure B4).

In response to falling inflation, the Central Bank of Brazil had embarked on successive reductions of its policy rate (the Selic, an overnight interbank rate). As seen in Figure B5, the Selic rate stood at 18 percent at the beginning of 2006. From there, the Selic was reduced in small steps until it had fallen to 11.25 percent by September 2007.

As shown in Figure B2, the Selic reductions were followed by a reversal of inflation trends. Year-over-year inflation began increasing in the second quarter of 2007. Yet the impact on the exchange rate was insignificant, and appreciation continued.

As a result, the Central Bank of Brazil continued the program of reserve accumulation started in mid-2006. As discussed in Chang (2007), the program was explained as an effort to combat the appreciation of the Real and, at the same time, as a way to build a war chest of reserves to deal with future financial turbulence. Net international reserves would increase from US$ 62 billion in June 2006 to US$ 205 billion by September 2008 (Figure B6).

In this scenario, Brazilian authorities viewed the onset of the global financial crisis in 2007 as a non-event for Brazil. Indeed, the minutes of the December 2007 Monetary Policy Committee meeting stated

> "The Brazilian economy… does not seem to have been significantly affected by the recent turmoil, and should sustain its growth trajectory, essentially driven by domestic demand."

The global crisis did increase country risk, but the effect proved to be small and ephemeral (see Figure B1). Capital inflows and the appreciation of the Real continued unabated until September 2008.

Strong activity was coupled with rising inflation, which would surpass 6 percent by the third quarter of 2008. This situation eventually prompted a reversal of monetary policy. Starting in April 2008 the Selic was gradually increased from its level of 11.25 percent. It would reach 13.75 percent by September 2008.

Another component of the policy response was a 1.5 percent tax on foreign purchases of fixed-income securities, applied in March 2008. The restriction to fixed-income securities was to signal that the target was short-term inflows, while long-term inflows were not to be discouraged. The tax remained in place until October 2008.

So the Lehman collapse found Brazil in the middle of an overheating episode that was being addressed via monetary tightening. In mid-2007 a few regulations were amended to reduce the foreign exchange exposure of financial institutions,[2] and Brazil intervened in the FX market and discouraged short-term capital inflows. To keep inflation from surpassing the upper edge of its tolerance bands, however, the Central Bank of Brazil relied on conventional interest rate management.

3.1.2 The Lehman Period

The Lehman collapse resulted in a sudden halt to capital inflows to Brazil and to other emerging economies. Between early September 2008 and mid-October, Brazil's EMBI spread shot up by more than 400 basis points. During the same period, the Real lost more than 20 percent of its value (adjusted for inflation). Mesquita and Toros (2010, p. 114) describe many aspects of the subsequent liquidity crunch:

> "The exchange rate depreciation was magnified by the effects of non-financial corporate exposure to foreign exchange derivatives. BCB research…shows that such exposure was close to US$ 37 billion (delta) by the end of September 2008….The volume of export finance contracts, dubbed ACC, fell by 30% between September and October, while the rollover ratio of external debt fell from an average of 167% in January-October to only 22% in November. Short-term foreign funding of Brazilian banks contracted sharply from August…externally funded domestic credit, adjusting for exchange rate changes, fell by 11% between August and October 2008."

[2] Circulares 3351, 3352, and 3353.

The same authors stress that the first line of defense deployed by the BCB was to provide liquidity in different ways. The program of reserve accumulation quickly became one of dollar sales, both in the spot market and in repo auctions. Between September 2008 and February 2009, the BCB sold US$ 26 billion, or about 13 percent of its net foreign reserves.

Since many firms had gone short in US dollar swaps to protect themselves against future Real appreciation, Real depreciation jeopardized the financial condition of the nonfinancial corporate sector. So, in October 2008 the BCB announced that it would offer up to US$ 50 billion, or about one fourth of its reserves, in foreign exchange swaps. This move seems to have succeeded in reducing market volatility, and at the end actual demand for swaps was limited to US$ 12 billion.

The BCB decision to provide ample amounts of dollar liquidity was facilitated by the large war chest (more than US $200 billion) that had been accumulated in the preceding period. In addition, the BCB was also helped by an October 2008 currency swap agreement with the Federal Reserve, by which the latter committed up to US $ 30 billion to Brazil. This facility was not used, but market commentary is clear in that its availability contributed to calming the markets.

In the last quarter of 2008, the BCB was reluctant to reduce the Selic rate. Indeed, the rate was maintained at 13.75 until the end of January 2009. One reason for the delay was to avoid sending a contradictory signal with respect to the achievement of the inflation target (recall the Lehman collapse interrupted a process of dealing with overheating). Moreover, the steep depreciation of the Real was bound to exacerbate inflationary pressures.

Instead, the BCB sought to increase domestic liquidity in other ways—chiefly via a reduction in reserve requirements. Montoro and Moreno (2010, p. 61) calculate that the effective reserve requirement ratio (the ratio of reserve requirements held by banks over deposits subject to requirements) fell by 10 percent points. This reduction was coupled with incentives (lower requirement ratios) for large banks to finance smaller institutions in order to cope with an observed “flight to quality” problem.

In addition, the BCB changed discount window regulations to extend the maturity of discount loans and to widen the range of acceptable collateral. Finally, deposit guarantees were broadened, including the creation of guaranteed time deposits.

As markets stabilized, the Selic rate was reduced gradually: from 13.75 at the start of 2009 to 8.75 in July. By the middle of 2009 the economy was in neutral gear. Inflation pressures had subsided and GDP growth was zero or slightly negative. Confidence seems to have returned gradually in the second half of 2009. By the end of the year, the EMBI spread and the real exchange rate were both back at their pre-Lehman levels.

As emphasized by Mesquita and Toros (2010), the BCB response was complemented by a strong expansion of state owned banks: "large public sector banks accounted for 34% of total credit by June 2009, compared with 28% by August 2008."

3.1.3 Developments since the Crisis

A lackluster 2009 was followed by a strong recovery in 2010, which recorded 7.5 percent GDP growth. Country risk eased, capital inflows resumed, and real appreciation was initially steady: the Real appreciated by 15 percent in real terms between the start of 2010 and mid-2011.

The strong pace of activity was reflected in accelerating inflation. As shown in Figure B2, year-over-year inflation crept up to reach 7.5 percent in the third quarter of 2011. This figure was outside the inflation-targeting tolerance band.

The policy response again included both conventional and unconventional components. On the conventional side, the Copom initiated a series of increases of the Selic rate, which brought it from 8.75 percent in April 2010 to 12.50 percent in July 2011.

Because interest rate increases fostered the appreciation of the Real, the BCB reinitiated FX purchases. Net foreign reserves, which stood around US $ 200 billion at mid-2009, climbed to about US $ 325 billion by mid-2011. As this proved insufficient, the government reestablished taxes on capital inflows. In October 2009, a 2 percent tax on foreign purchases of both fixed income securities and equities was applied. The rate of the tax was increased to 4 percent and then to 6 percent in October 2010, but only for bonds. In March 2011, a 6 percent tax on short-term foreign loans was imposed.

Finally, the BCB raised reserve requirements in December 2010: required ratios jumped from 8 percent to 12 percent for cash deposits and 15 to 20 percent for time deposits (these increases were reversed).

Results have been mixed. One does not know the counterfactual, but it is unclear that policies enacted had a substantial impact on Real appreciation. Indeed officials switched from combative statements that "they had an infinite amount of weapons at their disposal" to the admission that "the currency war had been lost." Growth slowed down markedly in 2011 and inflation returned to acceptable levels. Whether these developments reflect the effectiveness of policy actions or the impact of foreign events is not evident. At the time of writing, the BCB is trying to prevent further deceleration.

3.2 The Experience of Chile

3.2.1 2007 to Lehman

At the beginning of 2007 Chile was experiencing a period of high terms of trade caused by the exceptional price of copper (see Figure CL1). The terms of trade were almost 75 percent higher than the average for the previous 10 years. The economy was growing rapidly: 5.5 percent in annual terms in the first half of 2007 (see Figure CL2). This strong GDP growth was the result of expansionary domestic macroeconomic policies and favorable international conditions (Figures CL3 and CL4).

In the course of 2007 inflation picked up due to increases in specific prices, mainly related to the jump in the international food prices. Additionally, the domestic price of perishables was increasing because of unusually harsh weather in the 2007 winter (Figures CL5 and CL6). Core inflation measures were below the inflation target of 3 percent.

Lack of rain, coupled with the reduction in natural gas imports from Argentina, caused electricity generators to shift towards more expensive, less value-added technologies such as burning coal and diesel. This change significantly increased the price of energy and resulted in a lower rate of growth of output during the second half of 2007.

Despite the significant improvement in the terms of trade, in 2007 the real exchange rate remained close to the average value for the period 1986-2006 (Figure CL7). Things started to change by the end of 2007, as the nominal exchange rate began to appreciate significantly (Figure CL8). By March 2008, the nominal exchange rate had appreciated more than 11 percent with respect to December 2007. In real terms the appreciation of the real exchange rate reached 7.5 percent in the same period, while the price of copper increased more than 25 percent. At that point the Central Bank intervened in the FX market and began buying dollars.

The combination of high oil prices and a more depreciated exchange rate increased tradable goods inflation. At that point, inflation expectations in the monetary policy horizon (two years) started to deviate significantly from the inflation target (Figure CL9).

Because core inflation measures were still below the target, the Central Bank believed (and publicly stated) that the increase in headline inflation did not come from inflationary pressures related to the business cycle. The key challenge for the Central Bank was to increase the interest rate just enough to avoid second-round effects that could affect inflationary expectations. The monetary policy rate was raised by 100 basis points in the course of 2007. Headline inflation went from 2.8 percent in January to 7.8 percent in December.

With the peso appreciating strongly, in April 2008 the Central Bank announced a program of international reserve accumulation. The program involved daily purchases of US$ 50 million, for a total of US $8 billion (around 4.5 percent of GDP). The stated objective of the program was to improve Chile's liquidity in the context of the incipient financial turbulence in international capital markets (Figure CL10). Three months after the intervention was announced, the exchange rate had depreciated more than 12 percent.

Between January 2008 and June 2008, the monetary policy rate was kept unchanged. In the same period, annual inflation rate went from 7.5 percent to 9.5 percent. In this context, inflation expectations rose significantly, as mentioned earlier. Then, starting in June 2008 and through September 2008, the Central Bank raised the interest rate from 6.25 percent to 8.25 percent. So when the rest of the world came crashing down in the last quarter of that year, inflation was the chief problem facing the Chilean economy.

3.2.2. The Lehman Period

Starting in late September the spreads of Chilean external debt suffered a significant increase, in line with the increase in many other emerging markets. Rates charged on foreign loans to local banks rose far above the levels observed in the second half of 2001, while the sovereign spread (EMBI) and corporate spreads also went up and approached 2001 levels (Figure CL11).

Although foreign liabilities (mainly used to finance foreign trade operations) represented no more than 10 percent of total liabilities for the majority of domestic banks, the squeeze on the main global banks raised doubts regarding the capacity of the local banking sector to roll over external credit lines. These doubts in turn triggered a sharp increase in demand for liquidity in

domestic and foreign currency. This situation translated into a significant increase in domestic interest rates. Deposit rates in domestic and foreign currency increased significantly in local markets (Figure CL12).

The policy response aimed at the transmission channels through which the external crisis was manifesting itself in Chile. A first channel was financial: reduced access to external financing and higher costs for that financing. A second channel was real: weaker external demand and lower commodity prices.

Given tighter external financing conditions and strong demand for liquidity, at the end of September of 2008 the Central Bank of Chile announced a program of repos and swaps with the objective of providing domestic and foreign liquidity to domestic financial intermediaries. The stated goal was "to mitigate the effects of the external turmoil on the local economy, thereby safeguarding the stability of the financial system and the normal functioning of internal and external payments."

The international liquidity provision program consisted initially in 28-day dollar swap auctions for a period of four weeks, with transactions of US$ 500 million per week. These operations were sterilized with repos of the same maturity. The length and terms of the swap program were expanded gradually. On October 2008, the Central Bank extended the program from 1 to 6 months and extended its length from 60 to 90 days. In December 2008, the Central Bank extended the maximum maturity of the swaps to 180 days and extended the program for all 2009. The operations of this program between late September and mid-December of 2008 are presented in Table CL1.

The international liquidity program of the Central Bank was not the only measure to foster foreign currency provision to domestic markets. In early October 2008, the Ministry of Finance transferred US$ 1.05 billion of its own assets, previously deposited abroad, to time deposits in local banks. Later that year, with the Central Bank acting as fiscal agent, the Ministry of Finance auctioned US$ 700 million in dollar deposits (see Table CL2 for the late 2008 operations of this program).

With dollars scarce, official dollar purchases on the FX market had to be suspended. On September 29, the Central Bank announced the end of its international reserves accumulation program. At the time of the announcement, the Central Bank had completed US$ 5.75 billion in dollar purchases.

In October the Central Bank temporarily authorized financial institutions to use local currency, euros, and yen to complete their foreign currency reserves holdings, and on October 10 the Central Bank increased the range of collateral accepted in their domestic currency operations in order to ease peso liquidity pressures. In particular, it accepted bank deposits as collateral for seven-day repo operations for a period of six months. Following this announcement, in the fourth quarter of 2008 some 43 percent of repo operations were guaranteed with bank deposits.

In addition to expanding eligible collateral for domestic currency operations, in December 2008 the Central Bank of Chile extended the use of bank deposits as collateral through the end of 2009 and expanded the eligible transactions (up to 28 days). It also introduced a longer-term mechanism (over 28 days) to provide liquidity, based on a line of credit that took Treasury bonds, among others, as effective collateral.

All this liquidity provision by the Central Bank reduced deposit interest rates in domestic markets, which in turn allowed the deposit interest rate in domestic currency to align itself with the monetary policy rate. In the first phase of the response to the external shock the monetary policy rate remained constant. True, the short rate had been expected to rise and it did not. But despite the severity of the shock, it did not go down either. The key was inflation. The Central Bank indicated in the monetary policy statements of October and November that inflation measures, including core inflation, remained significantly high.

Gradually things began to change. In the monetary policy statement of December 2008, the Central Bank indicated that in the most likely scenario, a period of interest rate cuts would begin in January 2009. Inflation, which had reached almost 10 percent in October 2008 due to high food and energy prices, dropped quickly as commodity prices reverted from record highs (Figure CL5). In less than five months, the inflation rate fell below 2 percent, and, despite the strong depreciation of the peso in late part of 2008, inflation continued to fall.

In spite of the policy response, domestic financial conditions tightened significantly. By early 2009 it was clear that the credit market was going through a period of significant reduction in credit growth (figure CL13). The slowdown in the economy led to a rapid adjustment in monetary policy rate expectations. The forward curve changed dramatically in that period (Figure CL14).

Domestic demand fell 9.2 percent in the first half of 2009, with investment falling 14.8 percent. Nonetheless private consumption fell only 1.9 percent in that period. Once inflation

rates started to fall and the effects of the negative external scenario on the Chilean economy started to materialize, the Central Bank cut the monetary policy rate aggressively in the first half of 2009 (Figure CL4).

With the economy losing traction and inflation expectations still falling, the Central Bank reduced the policy rate to 75 basis points in June 2009 and added one additional statement in its monetary policy communiqué: "The Board considers that, in the most likely scenario, it will be necessary to maintain the monetary stimulus for a longer period than the one implicit in financial asset prices. This permits projected inflation to stand at 3% over the policy horizon." This statement reflected the Central Bank's attempt to signal a more expansionary path for the monetary policy rate than what was foreseen by private agents.

In its next monthly monetary policy meeting, the CBCH cut the monetary policy interest rate by 25 basis points, to 0.50 percent, and adopted complementary monetary policy measures. The communiqué from the July 2009 monetary policy meeting stated that "…for projected inflation to reach 3% over the policy horizon within a context of a foreseen widening of the output gap and reduced imported cost pressures, it is necessary to increase the monetary stimulus. Therefore, the monetary policy rate will be held at this minimum level for a prolonged period of time."

Additionally, in order to reinforce this decision and align financial asset prices with the path of monetary policy, the Central Bank of Chile implemented the following complementary monetary measures:

- To establish a term liquidity facility (*Facilidad de Liquidez a Plazo*, FLAP) for banking institutions, offering 90 and 180-day liquidity at the prevailing level of the monetary policy rate.
- To adjust the program of Central Bank note issuance at maturities below one year, consistent with the earlier decision.
- To suspend, for the rest of 2009, the issuance of debt instruments maturing in one year or more (two-year Central Bank peso-denominated bonds, BCP-2, and one-year Central Bank notes, PDBC-360).

Eligible collateral for the FLAP included Central Bank instruments, time deposits, and bank mortgage bills. The FLAP was widely used by local banks, with use peaking at CLP $3.284

trillion in mid-January 2009, an amount equivalent to 40 percent of the banking system's capital and reserves. To sterilize the injection of resources associated with the FLAP, the Central Bank issued additional short-term bonds (PDBCs) with a maximum of CLP $3.0 trillion in early February.

These measures seemed to have an immediate impact. The swap curve flattened. This, together with the drop in Central Bank bond rates, implied a reduction on the order of 100 basis points in the expected monetary policy rate over the relevant policy horizon (Figure CL15). Time deposit rates recorded a similar drop. In the September Inflation Report, the Central Bank of Chile indicated that the interest rate path implicit in financial asset prices was now consistent with the path considered in its baseline scenario.

These unconventional policy measures affected not only the interest rate structure, but also the monetary aggregates. The FLAP caused an expansion of local-currency assets on the Central Bank's balance sheet by generating credit to the banking institutions (Figure CL16).

The economy started to recover rapidly starting in the third quarter of 2009. During 2009Q3 the economy grew 7.3 percent quarter-on-quarter (annualized rate). In the last quarter of that year the economy experienced an annualized quarter-on-quarter rate of growth of 8 percent. Financial conditions for households and firms started to normalize during this period.

3.2.3 Developments since the Crisis

The earthquake of February 2010 postponed but did not abort the recovery of the Chilean economy. In fact, GDP growth in 2010 surprised on the upside and ended up being higher than forecasted by the Central Bank in its Monetary Policy report of December 2009.

In this context, the Central Bank initiated a process of normalization of the monetary policy rate in June 2010. The speed of this process was not without controversy due to its potential effect on the nominal exchange rate. In fact, the nominal exchange rate appreciated more than 11 percent between June 2010 and the end of that year, while the real exchange rate appreciated close to 7 percent in the same period.

In this context, the Central Bank once again announced a process of international reserve accumulation. The Central Bank justified the intervention alluding to the need to strengthen its international reserve position. Unlike during the 2008 intervention, the exchange rate did not

depreciate significantly. Nevertheless, the speed of appreciation after the intervention was lower than in the previous months.

3.3 The Experience of Colombia

3.3.1 2007 to Lehman

At the beginning of 2007, Colombia was experiencing an incipient overheating episode. As shown in Figure C1, GDP growth had been steadily accelerating: from less than an annual rate of 2 percent in 2001 to almost 7 percent in 2007.

Faster growth during that period seems to have had several causes. Like other Latin American countries, Colombia benefited from a favorable world environment, including falling world interest rates and strong markets for its exports. Yet Colombia's terms of trade improved less (only about 10 percent between 2004 and 2007) than those of Chile and Peru. Hence domestic developments—in particular improvements in political stability and security—as well as prudent macroeconomic management, may have been more important than external variables in fostering growth.

The increase in local business confidence was coupled with a continuous fall in foreign credit spreads: the EMBI spread, which had touched 600 basis points in 2004, would fall below 100 bps by mid-2007 (Figure C2). Domestic investment growth, which had been less than 10 percent before 2003, increased to more than 12 percent between 2003 and 2005, then surpassed 19 percent in 2006 (Figure C3). Much of that growth was financed from abroad, especially via an increase in net FDI flows (Figure C4).

Against this backdrop three worrisome trends became apparent. One was accelerating credit growth, which would exceed annual rates of 30 percent in 2006-7 (Figure C5). A second was gradually increasing inflation, especially between May 2006 and May 2007 (Figure C6). Some of the run-up in inflation was attributed to higher world food prices, but similar trends were visible in other price indicators, especially those of non-tradables, confirming that inflation was widespread and most likely related to excess demand.

The other cause for concern was a strong appreciation of the Colombian peso. Figure C7 shows that, between June of 2006 and June of 2007, the nominal appreciation was about 30 percent, as the exchange rate went from about 2,500 pesos per US dollar to 1,925 pesos per dollar during that period.

Colombia fully adopted an inflation-targeting regime in 1999, when a system of exchange rate bands was abandoned. The Banco de la Republica has a long-run inflation target of 3 percent, with targets and tolerance bands for the next two years announced towards the end of each calendar year. For 2006 the inflation target was 4.5 percent with a plus or minus 0.5 percent allowance. For 2007 the target was 4 percent, still with a 0.5 percent allowance.

The Banco de la República identified inflationary pressures early in 2006. As a consequence, it carried out a series increases of its policy rate, an overnight repo rate. This move would gradually bring the policy rate from 6 percent in April 2006 to 10 percent in August 2008, in 25 basis points steps, as displayed in Figure C8.

Increasing interest rates in this manner, however, was insufficient to curb growth by enough to stop inflation from accelerating. CPI in 2007 would reach 5.7 percent, more than 1 percent above the 3.5-4.5 percent band. The policy options were further complicated by the strong appreciation of the peso.

To combat peso appreciation, in early 2007 the Banco de la República resorted to very large purchases of US dollars: between January and April of that year, discretionary dollar purchases topped US$ 4.5 billion, increasing net foreign reserves by more than one third (Figure C9). However, dollar purchases were at odds with the contractionary interest policy and the attainment of the inflation target (Chang, 2007). As a result, foreign exchange intervention appears to have backfired and fostered carry trade: witness the unusual growth of the financial account surplus during 2007, over and above the growth of net FDI flows (Figure C4). Perhaps due to these factors, the Banco de la República discontinued dollar purchases in May 2007.

Neither interest rate increases nor foreign exchange intervention had made a dent in controlling credit whose growth, at annual rates of more than 30 percent rates, seemed unsustainable (Figure C5). In view of this, in May 2007 the Banco de la República announced the reintroduction of capital controls, which had not been seen since 2000, and a tightening in reserve requirements.

The key move on capital controls was a requirement that 40 percent (increased to 50 percent in April 2008) of foreign portfolio investment be held without interest at the Banco de la República for six months. In addition, it placed a limit (of five times capital) on the exposure of financial intermediaries to foreign exchange derivatives.

As for reserves, starting May 2007, a marginal requirement of 27 percent on checking and sight deposits, and of 12.5 percent on savings deposits, was added to an existing average reserve requirement of 13 percent on demand and sight deposits and 6 percent on savings deposits. A month later, in June 2007, the marginal requirement on savings deposits was raised to 27 percent, the same as with demand and sight deposits. To compensate in part, all deposits were to be paid interest of 37.5 percent of the inflation target (previously, only savings deposits were paid interest of 75 percent of the target).

As shown by Figure C5, the capital controls together with the increase in reserve requirements was followed by gradually lower credit growth, although by the middle of 2008 annual growth rates were still in excess of 20 percent. Overall, the combination of higher policy rates and higher reserve requirements seem to have had some but only limited success in preventing overheating.

By the middle of 2008, inflation was still clearly above the Banco de la República's 3.5-4.5 percent target range. The June 2008 *Inflation Report* attributed most of the previous year's inflation to rising food prices. However, other inflation indicators, most notably the inflation rate for non-traded goods and the PPI, were also well above the target range. Real GDP growth in 2007 reached 6.9 percent—a figure that, as the *Inflation Report* noted, was close to historical highs.

The onset of the global financial crisis towards the second half of 2007 did not affect Colombia as much as other Latin American countries. The EMBI spread increased from about 100 bps in June 2007 to about 270 bps in March 2008, but then it fell back to about 185 bps by June 2008. The exchange rate continued appreciating, and at first financial flows seemed to continue unabated. Indeed, in its June 2008 Inflation Report (page 50) the Banco de la República stated (page 50)

> [The Bank's] central scenario assumes that the decisions of foreign investors about ongoing projects will not be affected by uncertainty about recession in the US. So, it is expected that FDI flows will reach similar levels as those of 2007.

3.3.2 The Lehman Period

The Lehman collapse, in September of 2008, was followed in Colombia by much slower growth and a fall in inflation. GDP growth in 2009 was only 1.45 percent, and investment growth was negative. CPI inflation fell to 2 percent, significantly below the inflation tolerance band of 4.5-5.5 percent that had been set for 2009.

The importance of external factors, however, seems relatively minor. We have seen above that the Banco de la República not only had enacted a series of policy rate increases until July 2008, but had also tried to curb credit growth by increasing reserve requirements and imposing capital controls. In addition, as Figure C5 shows, the growth of credit to the private sector had been falling since mid-2007. Both GDP growth and investment growth had also been markedly slower in 2008 than in 2007.

Moreover, the impact of the Lehman episode on external indicators was comparatively mild and short lived. Colombia's EMBI spread jumped up about 500 basis points (to more than 740 bps) in October 2008. But by mid-2009 the spread had fallen to 420 bps, and by the end of 2009 it was back to pre-Lehman levels. The peso depreciated by about 25 percent between September 2008 and February 2009, but by June 2009 the exchange rate was back to where it was pre-Lehman.

Credit for the relative stability of the Colombian economy in the face of the Lehman crisis should go, at least in part, to the rapid reaction of the Banco de la República. As in other Latin American countries, the most immediate response was unconventional. In October 2008, average reserve requirements were reduced (marginal requirements had been eliminated in June 2008), and in January 2009 interest on reserves was cut. Likewise, in October 2008 controls on capital inflows were lifted. Finally, Banco de la República purchased Treasury debt to the tune of 500 billion pesos (approximately US$ 250 million).

The conventional response was a sequence of reductions of the policy rate, starting in December 2008 from 10 percent, in steps ending with a 3 percent rate by May 2010.

3.3.3. Developments since the Crisis

2010 was a strong year for Colombia. Real GDP growth reached 4.3 percent, and the growth of investment surpassed 12 percent. Foreign capital inflows resumed, although FDI inflows were somewhat below those of 2006-7 (but 2011 FDI inflows appear to be much stronger).

As before the global crisis, these favorable developments have come together with some worrisome signs. Credit growth, which had touched zero in 2009, has since accelerated, and recently it reached year-on-year rates of 35 percent (Figure C5). Inflation has picked up, although it remains close to the current target of 3 percent. Most notably, the peso has been appreciating continuously.

The response from the Banco de la República has been again multifaceted. In particular, the bank explicitly cited "signs of exchange rate misalignment" to embark in a program of dollar purchases, starting in March 2010. It purchased US$ 400 million every month until October 2011, except for a brief interruption in July-August 2010. One result is that Colombia's net foreign exchange reserves have swollen from US $ 25 billion in March 2010 to US $ 32 billion as of October 2011.

The impact on the exchange rate is less clear. Banco de la República, in several documents, claims that foreign exchange intervention has been effective, and indeed that the Colombian peso depreciated while other Latin American currencies appreciated against the US dollar. Figure C7 shows, however, that since the first quarter of 2009 the trend is decidedly towards appreciation.

To prevent overheating, Banco de la República raised its policy rate starting in February of 2011, taking it from 3 percent to 4.5 percent in July. Whether these increases will be effective in putting a check on growth remains to be seen.

It is noteworthy that the recent interest rate increases took place at the same time as Banco de la República was committed to a dollar-purchasing program. Foreign exchange intervention was again at odds with the overall policy stance, in a way reminiscent of the 2006-2007 period (Chang, 2007). This fueled speculation about the return of capital controls, to the point where Finance Minister J.C. Echeverry had to go on record disavowing the idea.

3.4 The Experience of Mexico

3.4.1 2007 to Lehman

By the beginning of 2007 the Mexican economy was decelerating relative to the solid growth of 5.2 percent exhibited in 2006 (Figure M1). In annual terms, in the first half of 2007 the economy grew at an average rate of 3 percent. The deceleration was partly the result of a less dynamic

economy in the United States, Mexico's main trading partner. Nevertheless, domestic Mexican demand continued expanding at a healthy clip.

Inflation was a problem, though a diminishing one. Since mid-2006 the Mexican economy had experienced several supply shocks that had pushed the inflation rate from 3.1 percent in July 2006 to 4.2 percent in March 2007. This figure was above the 4 percent upper limit of the comfort band defined around the 3 percent inflation target.

The Banco de México was expecting a reduction in the inflationary pressures due to an anticipated drop in world economic growth and in energy prices. The hope was that the inflation rate would converge to the inflation target by the beginning of 2008. This was consistent with the view that the increases in food and energy prices were changes in relative prices that would not contaminate inflation dynamic in the context of well-anchored inflation expectations.

By mid-2007, the prospects for that year had improved relative to what was expected at the beginning of the year. Positive second quarter data for the United States helped fuel that perception (Figure M2). The improved external conditions were reflected in local activity data: during the second half of 2007 the Mexican economy grew at an average rate of 3.5 percent.

At the same time it was becoming clear that food and energy prices would follow a higher trajectory than had been expected earlier. In order to prevent potential un-anchoring of inflation expectations, Banco de México increased the overnight interbank interest rate 25 bps in April and 25 bps again in October of 2007 to reach 7.5 percent (Figure M3).

Headline CPI inflation ended the year 2007 at 3.8 percent, below the 4.1 percent of December 2006. But core inflation reached 4 percent, above the 3.6 percent in December 2006. Headline inflation dynamics were clearly influenced by the freeze prices of gasoline, gas and electricity decreed by the government in the last quarter of 2007, which contained the increase in the inflation rate.

By mid-2008, external financial turbulence and the drop in US growth (due to the contraction in residential investment and the significant increase in commodity prices) were beginning to affect Mexico. The local economy slowed while, pushed again by commodity prices, in the first half of 2008 inflation exhibited an increasing trajectory (Figure M4).

By June 2008, the inflation rate reached 5.3 percent in annual terms, up from 3.8 percent in December of 2007. Economic activity increased only 2.8 percent in annual terms in the first half of 2008, below the 3.8 percent exhibited in the second half of 2007. In the opinion of the

Central Bank, the impact of the deceleration of the US economy on the Mexican economy was of limited magnitude.

During this period inflation expectations for the short run increased but remained relatively unchanged for longer horizons (see Figure M5). In this context, Banco de México decided to increase the monetary policy rate 25 bps in each of three consecutive months (June, July and August 2008), taking it to 8.25 percent. The yield curve during this period continued steepening. This process increased the interest rate differentials with the United States, which in turn generated pressures towards the appreciation of the nominal exchange rate. Between January and July 2008, the nominal peso/dollar exchange rate appreciated almost 10 percent.

In July 2008, the (Foreign) Exchange Commission (a governmental entity composed of officials from the Ministry of Finance and Banco de México, whose remit is exchange rate policy) announced it was suspending a 2003 mechanism whose objective was to reduce the rate of foreign reserves accumulation. The commission indicated that the change aimed to compensate the anticipated accumulation of US$ 8 billion announced the Ministry of Finance. This decision by the Commission implied a lower provision of dollars to market participants.

3.4.2 The Lehman Period

The uncertainty triggered by the collapse of Lehman Brothers generated a significant increase in long and medium term interest rates in Mexico (Figure M6). Investors shifted their portfolios from longer maturity government bonds towards short-term government bonds. Ten-year government bonds went from interest rates of around 8.5 percent to rates close to 11.5 percent in a short period of time.

Foreign currency liquidity dropped significantly in October 2008 due to the strong demand for dollars by non-financial and financial institutions trying to meet margin calls or cover their financial exposure. As discussed by Sidaoui, Ramos-Francia and Cuadra (2010), in Mexico the impact of the shock was magnified by the exposure of large corporates to foreign currency through complex derivatives instruments. Those corporates had engaged in derivatives transactions and had open positions such that, in the view of the authorities, a sharp depreciation of the Mexican peso would have caused massive losses.

In this context, the authorities decided to use part of their international reserves to curb foreign exchange volatility and to reestablish the orderly functioning of financial markets. The

Exchange Commission carried out an exchange rate intervention whose stated objective was to reduce financial stability risks due to exchange rate volatility. The Exchange Commission indicated that this intervention was not intended to support any predetermined exchange rate but rather to provide liquidity to satisfy the unusual demand brought about by exchange rate fluctuations.

The intervention was carried out through large-scale and repeated supply of US dollars channeled to the market via auctions. In the first place, the Commission reintroduced the mechanism to auction US dollars on a daily basis at a minimum exchange rate of 2 percent higher than the previous business day's exchange rate. The maximum daily amount for these auctions was fixed at US$ 400 million. During October 2008, more than US$ 2 billion was auctioned through this mechanism. Moreover, extraordinary auctions were carried out for a total of US$ 11 billion US.

At that time Banco de México also created new liquidity facilities.[3] The purpose of these facilities was to support monetary policy by encouraging institutions with excess liquidity to transfer it to those that lacked it. These new liquidity facilities gave commercial banks access to Banco de México's funding for the amount they required under eligible collateral. The Ministry of Finance also adjusted its programmed allotments in such a way as to keep total net domestic financing unchanged. These adjustments reduced the amount auctioned as long-term fixed-rate bonds.

Despite the negative outlook for the world economy, in October 2011 Banco de México indicated that the outlook for inflation was not modified compared to the one expected in the previous quarter. The reason was that those factors that were expected to reduce inflationary pressures were compensated by the depreciation of the nominal exchange rate. Nominal depreciation between the end of July and October was close to 25 percent (see Figure M7).

During the last quarter of 2008 inflation continued increasing in line with official estimates. By December 2008, the inflation rate had reached 6.5 percent, up from 5.45 percent in September 2008. Banco de México indicated that the increase in inflation was explained mainly by two factors: increases in administered prices (low-octane gasoline, LP gas, and electricity

[3] Under the existing facilities commercial banks could obtain financing from Banco de México at a rate twice the overnight interbank interest rate or could make non-interest bearing deposits in the central bank.

among them) that took place in the fourth quarter of 2008 and the impact of the depreciation on food and non-food purchases.

The weakening of the world economy, especially in the United States, led to a contraction of Mexican manufacturing exports (Figure M8). It also affected revenues from workers' remittances and international travelers. The associated decline of international commodity prices, including oil, lowered Mexico's terms of trade. In this context economic activity suffered, with GDP contracting 1.1 percent year-on-year in the last quarter of 2008.

The deterioration in the external financial outlook generated uncertainty about the availability of financing for the 2009 current account deficit. With the purpose of reducing such uncertainty and its effect on the exchange rate market, Banco de México and the government adopted a series of measures in March 2009.

The measures announced were the following: i) daily US dollar auctions (without pre-announced minimum prices) for US$ 100 million; ii) daily US dollar auctions with pre-announced minimum prices were cut from US$ 400 to US$ 300 million; and, iii) extraordinary foreign currency auctions to be carried out depending on market needs. Up to April of 2009, US$ 3.2 billion US were sold through the daily auctions mechanism.

On April 17 the International Monetary Fund approved Mexico for its Flexible Credit Line (FCL) facility, making available US$ 47 billion for one year. Additionally, Banco de México began holding US dollar auctions for Mexican commercial and development banks, tapping into resources from the temporary facility agreed upon with the US Federal Reserve.

Responding to the much-deteriorated outlook for the economy, in early 2009 Banco de México began a cycle of deep cuts in the monetary policy rate. This process took the monetary policy rate from 8.25 percent in December 2008 to 4.5 percent in July 2009.

After suffering a significant GDP contraction in the first half of 2009 (-8.6 percent year-on-year), the economy started to recover in the second half of that year. Nonetheless, Mexico ended 2009 with a GDP contraction of 6.1 percent—the worst performance among the larger Latin American countries. Predictably, in the course of 2009 inflation fell sharply. After peaking at 6.6 percent in December of 2008, 2009 inflation was just 3.6 percent.

3.4.3 Developments since the Crisis

After the significant contraction in 2009, the Mexican economy rebounded strongly (Figure M1), and in 2010 GDP growth reached 5.4 percent. Preliminary estimations indicate that GDP growth for 2011 was 4 percent. The recovery of the economy in 2010 was initially led by the dynamic performance of manufacturing exports, helped along by the recovery in industrial activity in the United States at that time. By the beginning of 2011, however, it was clear that domestic demand was starting to pick up as well.

The mechanisms implemented to provide foreign liquidity to the markets were gradually discontinued. In September of 2009, the Exchange Commission decided to suspend the daily US dollar auctions without pre-announced minimum prices. In turn, in April 2010, the commission decided to suspend the daily US dollar auction with pre-announced minimum prices.

After worrying about depreciation of the peso for a couple of years, now the problem was appreciation. The nominal exchange went from around 13 pesos per US dollar to around 12 pesos per US dollar (far above the 10 pesos per US dollar before the bankruptcy of Lehman Brothers). At that point, the Exchange Commission decided to intervene in the exchange rate market. On February 22, 2010, the Exchange Commission announced the re-introduction of the put options auctions that enabled buyers to sell dollars to Banco de México. The action was publicly justified by the need to increase international reserves, whose usefulness had been underscored by the financial crisis of 2008-2009 (see Figure M9).

The new policy would not last long. In the context of the sovereign debt problems in Europe, the nominal exchange rate depreciated significantly by more than 20 percent between August and October of 2011. On November 29, 2011, the Exchange Commission announced that the monthly auctions of put options would be temporarily suspended and that dollar auctions with a minimum price would be reactivated until further notice.

Starting in August 2009 and up to the time of writing, the monetary policy rate has been kept unchanged. This policy decision has resulted from a stable inflation rate during this period (slightly above the 3 percent target) and a gradual reduction in the output gap.

3.5 The Experience of Peru

3.5.1 2007 to Lehman

At the beginning of 2007 Peru was experiencing a boom that could be attributed to several factors. One was the favorable world market for Peru's exports. Between the end of 2004 and the middle of 2007, Peru's terms of trade improved by more than 40 percent, led by a quadrupling of the price of copper (figure P1). This was reflected in a sizable increase in the value of exports, which jumped from 18.4 percent of GDP in 2004 to about 26 percent of GDP in 2006 and 2007 (Table P1).

A second factor was the reduction in political uncertainty and the continuation of a sound macroeconomic policy environment. Investors had been reluctant to keep money in Peru during 2006, as presidential elections produced the return of Alan García, whose populist policies had led the country to hyperinflation two decades before. García, however, surprised markets by appointing a conservative, market-oriented economic team, clearly committed to monetary and fiscal discipline.

The return of confidence was evident in the steady reduction of country risk indicators: Peru's EMBI spread fell from more than 200 basis points at the beginning of 2006 to about 103 bps in June 2007 (Figure P2). Capital flows decidedly reversed direction: while during the first nine months of 2006, there had been a cumulative net outflow of US$ 1 billion in the financial account of the balance of payments, the last quarter of 2006 and the first quarter of 2007 saw net inflows of about US$ 1.3 billion. This trend would only become stronger later in 2007, as expressed in a surplus in financial account of 7.8 percent of GDP, a marked turnaround relative to 2005 and 2006, with surpluses of only 0.2 percent and 0.4 percent of GDP, respectively (Table P2).

The surge in capital inflows was a source of several concerns for the central bank. One issue was the behavior of credit: the growth of bank credit to the private sector jumped from about 10 percent at the end of 2006 to more than 30 percent at the end of 2007 (Figure P3). A second development was the appreciation of the Peruvian sol: the exchange rate went from 3.40 soles per US$ in January 2006 to 3.19 in January 2007 and 2.98 in January 2008 (Figure P4).

Finally, the economy started to display signs of overheating. GDP growth, which had weakened some in 2006, returned to the 8-10 percent range, and the inflation rate, which had fallen to almost zero in April 2007, started to increase rapidly. It would reach 4 percent at the end

of 2007, and surpass 4 percent by mid-2008, well above the 2 percent official inflation target (Figure P5).

Peru had established an explicit inflation-targeting regime in 2002. The 2002 Monetary Program set a 2.5 percent inflation target, together with a tolerance band of plus or minus 1 percent. In January 2007 the target was lowered to 2 percent, where it has been since.

Under this regime the main policy instrument has been the interest rate for overnight interbank loans. But the Peruvian Central Bank has not refrained from resorting to other instruments, in particular to foreign exchange intervention. In fact, Peru's Central Bank has both accumulated a vast stock of foreign exchange reserves and felt free to intervene in the foreign exchange market to tame volatility (see Chang, 2007, for a discussion).

The incipient overheating problem at the start of 2007 was met at first with a conventional interest rate response: the policy rate was raised from 4.5 percent at the beginning of 2007 to 5 percent at the end of the year (Figure P6). At the same time, the Central Bank engaged in a massive reserves accumulation drive. Between July 2006 and June 2007 the Central Bank purchased more than US$ 9 billion, bringing international reserves from US$ 14.2 billion to US$ 21.5 billion (Figures P7 and P8). It is noteworthy that, at the time, short-term foreign debt was only US$ 4.6 billion.

With the onset of the world financial crisis in the third quarter of 2007, capital inflows did not abate. Rather, they intensified. The Central Bank then embarked on a three-pronged strategy. First, the intervention rate continued to be increased, reaching 6.5 percent by September 2008. Second, dollar purchases accelerated: between July 2007 and April 2008 the Central Bank bought more than US$ 14 billion, bringing the stock of international reserves over US$ 35 billion.

A third and new element in the central bank response was to increase reserve requirements on the banking system. Prior to February 2008 the Central Bank had imposed marginal reserve requirements on domestic currency deposits in the banking system of 6 percent, and of 30 percent for foreign currency deposits. Those requirements were raised in successive steps, so that by September 2008 the marginal reserve requirements were 25 percent on domestic currency deposits and 49 percent on foreign currency deposits (Figures P9 and P10) In addition, reserve requirements on deposits held by foreign residents were set at 120 percent in May 2008.

To compensate for these moves, reserve requirements on long-term (two years or longer) foreign obligations of the banks were eliminated altogether.

It is unclear whether these policies had much of an effect on curbing the overheating problem. Credit growth continued to accelerate, and by the time of the Lehman collapse annual rates of growth were easily over 30 percent. By the end of 2008, the 12-month inflation rate reached 6.8 percent.

On the other hand, Central Bank policies did have a noticeable effect on the vulnerability of the economy to a sudden capital outflow, like the one associated with the Lehman bankruptcy. As already mentioned, the stock of international reserves was a multiple of short-term foreign debt. And the increase in reserve requirements for short-term foreign liabilities coupled with the elimination of such requirements for long-term liabilities did result in a substantial change in the maturity structure of banks' foreign debt. In September 2007 only 22 percent of the banking system's foreign debts were long term; a year later, that figure was 58 percent.

3.5.2 The Lehman Period

The Lehman bankruptcy in September 2008 and the associated global financial meltdown resulted in a retrenchment by international capital away from emerging markets. In the case of Peru the EMBI spread, which had been hovering below 200 basis points prior to the Lehman episode, rose to more than 500 bps towards the end of 2008. The turnaround in capital flows was quite dramatic: while the financial account had cumulated a surplus of more than US$ 14 billion from the last quarter of 2007 to the third quarter of 2008, the last quarter of 2008 saw a deficit of US$ 2.3 billion. This was clearly driven by short-term capital outflows, which amounted to US$ 2.6 billion during that quarter (Figure P11).

The capital outflows reversed the trend towards appreciation of the sol: the exchange rate, which had been around 2.90 soles per US$ before Lehman, would close 2008 at 3.12. The growth of credit came to a halt: year-to-year growth in bank credit to the private sector, which had surpassed 30 percent before Lehman, would steadily decline to virtually zero by the end of 2009.

The credit crunch was also evident in the behavior of domestic spreads between the prime lending rate and the policy rate, which jumped from about 60 basis points prior to Lehman to 130 bps in October 2008 (Figure P12 and Quispe and Rossini, 2011). Aggregate demand and

production both collapsed (Figure P13). The inflation rate, which had been increasing, started to fall and would become almost zero by the end of 2009.

Remarkably, the Peruvian Central Bank response to the Lehman crisis was not to lower the policy interest rate immediately. In fact, the policy rate was raised by 25 bps, to 6.5 percent, in September 2008. It would stay there until February 2009.

Instead, the Central Bank relied on "unconventional" instruments: reserve requirements, foreign exchange intervention, and some other liquidity measures. This stance seems to have followed from at least two factors: first, the belief that the credit crunch was essentially a liquidity shock, and hence that the policy response should be based on ensuring the provision of liquidity to the markets; second, that until the markets had stabilized, preserving credibility required that the Central Bank not start reversing the drive towards higher interest rates that had been interrupted by the Lehman crisis. Hence, Quispe and Rossini (2011, p. 309) wrote:

> As of October 2008, the BCRP interrupted the process of gradual adjustments to its monetary stance and reoriented its efforts to providing liquidity to the domestic financial system and reducing extreme exchange rate volatility to neutralize possible balance sheet effects in the economy, without neglecting its role of preserving price stability.

Thus, the Central Bank reversed the increases in reserve requirements that it had enacted just half a year earlier: marginal reserve requirements on domestic currency bank deposits were lowered from 25 percent back to 6 percent, and those on foreign currency deposits from 40 percent to 30 percent. In addition, the reserve requirement of 120 percent on short-term bank liabilities against nonresidents was lowered to 35 percent.

Enhanced liquidity provision was also sought through the expansion of Central Bank repo operations. Notably, the maturity of repo operations was increased to one year, and the range of acceptable collateral was widened. Likewise, the Central Bank started a new swap facility, with the express intention of extending liquidity to agents that did not have the collateral to qualify for repos. Finally, the central bank repurchased its own CDs from banks. All in all, Peru's Central Bank estimates it injected about 9.6 percent of GDP in the six months following the Lehman bankruptcy (Quispe and Rossini, 2011, p. 310).

To tame volatility in the exchange rate, Peru's Central Bank sold US$ 6.8 billion between September 2008 and February 2009. In addition, it issued US$ 3.3 billion in US dollar-indexed certificates.

These moves seem to have been effective. The exchange rate was remarkably stable after the initial depreciation and, starting in February 2009, the Peruvian sol resumed its appreciation. At that time domestic spreads fell: the difference between the prime rate and the Central Bank policy rate dropped by 50 basis points, to 87 basis points, by February 2009.

Believing that the financial turbulence had abated, and that the global crisis had brought a more lasting recession than originally hoped for, in February the Central Bank also started to reduce its policy rate. By August 2009, this rate was 1.25 percent, a fall of five-and-a-quarter percentage points relative to the beginning of the year.

3.5.3 Developments since the Crisis

While the Peruvian economy suffered from a slowdown and bottomed out around mid-2009, it recovered quickly and has recently enjoyed healthy growth. Aside from sound macroeconomic management, perhaps the most favorable factor has been the recovery of its terms of trade, which—led by the prices of copper and silver—have returned to their peak pre-Lehman levels. Domestic stability and favorable external conditions have resulted in a recovery of external creditworthiness: the EMBI spread now stands at the same levels as before the Lehman crisis. Concomitantly, capital inflows have resumed with gusto: in 2010 the financial account experienced a surplus of more than US$ 13 billion.

Domestic credit growth has been increasing, from annual rates of about 10 percent at the beginning of 2010 to more than 20 percent at the end of 2010. Aggregate demand and production have resumed strong growth rates, and inflation has picked up.

In response, the Central Bank has continued resorting to conventional and unconventional policy instruments. In 2010, the policy rate was raised between April and September from 1.25 percent to 3 percent; it has been raised again in successive steps since the beginning of 2011, and now it stands at 4.5 percent.

Also in 2010, the Central Bank resumed dollar purchases, adding about US$ 11 billion to its reserves. At the time of writing, net foreign reserves are almost US$ 50 billion, in contrast with US$ 33 billion at the end of 2009.

Finally, to check the accelerating growth in credit, reserve requirement were raised again. Between July 2010 and October 2010, marginal reserve requirements for domestic currency bank deposits jumped from 6 percent to 25 percent, and from 30 percent to 55 percent for foreign currency deposits. Hence, the same policy instruments were used in the downswing and upswing phases of the cycle. In this sense, Peru behaved like several of the other inflation-targeting nations in the region.

3.6 The Experience of Uruguay

Uruguay adopted a crawling peg exchange rate regime starting in 1990. This regime was established as a central component of the stabilization plan aimed to reduce inflation, which in 1990 had reached 110 percent. By contrast, in 1998 inflation was around 10 percent.

The system was to be tested during the Argentinean crisis of 2001-02. At first the pressure on the Uruguayan peso was strong, and increases in the width of the exchange rate band were applied to accommodate it. But no amount of financial engineering could erase the real effects on the Uruguayan economy, which were significant particularly because of the drastic reduction in exports to Argentina.

The bank run in Argentina also affected the Uruguayan financial sector, which experienced a significant decrease in deposits. At that point international reserves were too small to secure the exchange rate regime. In June 2002 Uruguay abandoned the crawling band exchange rate regime and started to use the monetary base as the nominal anchor for the economy. At the same time some inflation targets were announced, but there was no firm commitment to them.

Starting in 2004, however, the Central Bank began to signal a stronger commitment to the inflation target. The target for the monetary base was changed from a point target to a band in order to gain flexibility to fulfill the inflation targets. The final change came in 2005: since then the monetary base target is no longer the final target for the Central Bank, leaving the inflation target as the “only” target of monetary policy.

In 2002 Uruguay also announced it would follow a flexible exchange rate regime. Nevertheless, the monetary authorities recognized early on that given the high dollarization of the economy, excessive potential volatility was going to require “occasional” interventions. Those occasional interventions would become semi-permanent interventions in later years.

The June 2003 letter of intent to the IMF stated: "The government intends to maintain this framework as a means of anchoring inflationary expectations, building a track record for monetary policy credibility, and laying the groundwork for future adoption of inflation targeting. The Central Bank is committed to creating a deeper and more liquid market for peso instruments by expanding further the available range of peso instruments for liquidity management and by promoting market acceptance of inflation-indexed instruments."

In contrast, the November 2004 letter of intent stated: "The monetary program is on track, and we expect to meet the end-December program targets on NDA and NIR with comfortable margins. Base money growth targets have been maintained at the level announced in June, consistent with the attainment of a targeted inflation range of 6-8% by September 2005. The government will maintain the floating exchange rate policy."

The change in language suggests a clear shift in monetary policy strategy toward a system based on inflation targets. However, the adoption of inflation targets cannot be interpreted as the implementation of a full-fledged inflation-targeting regime. Greater transparency and accountability were necessary to fulfill the state-of-the-art standard (see Aboal, Lorenzo and Noya, 2003).

Some authors have argued that the exchange rate in Uruguay was effectively floating between 2002 and 2005. Nevertheless, since 2006 vigorous activism on the part of the Central Bank started to change this view (see Aboal, Lanzilotta and Perera, 2006).

The Central Bank of Uruguay is relatively autonomous. Its objective is "price stability that contributes to the objectives of growth and employment." It is also in charge of the proper functioning of the payments system and of the financial sector. A monetary policy committee comprised of three board members plus three members of the staff makes monetary policy. The Comité de Coordinación Macroeconómica (Macroeconomic Coordination Committee), made up of the three members of the board of the Central Bank of Uruguay plus representatives from the Ministry of Finance, sets the inflation target.

3.6.1 2007 to Lehman

After the 2002 crisis, Uruguay recovered quickly (Figure U1). Appreciation pressures in late 2005 were dealt with by significant exchange rate interventions (Figure U2). However, those interventions were not sterilized, which generated a significant increase in money growth. The

Central Bank felt this was not a problem since headline inflation had fallen significantly (Figure U3). At that point the country moved to a managed float. In 2007 foreign exchange purchases were mainly undertaken by the government to meet its foreign currency needs.

By 2007 inflation had increased above the inflation targets announced by the authority (Figure U4). This deviation was seen as transitory, due mostly to adverse supply shocks affecting the economy (drought in 2006 and floods in 2007). Nevertheless, core inflation measures were also picking up, suggesting nascent demand pressures. At the beginning of 2007, the unemployment rate was at its lowest level for the decade and real wages were increasing rapidly.

In this context, the Central Bank initiated a monetary policy tightening cycle in March 2007, reducing the (intermediate) M1 target and sterilizing exchange rate interventions. In this period the Central Bank was seen as having both an inflation objective and also an exchange rate objective of 24 pesos per dollar (figure U5). The authorities claimed that the pressure on the local currency was mainly due to temporary FDI flows (associated with pulp mills). Given that international reserve levels were below a comfortable level and given Uruguay's degree of dollarization an "opportunistic approach to reserve accumulation" was carried out (Figure U6).

With food prices increasing rapidly, CPI inflation increased and so did core inflation measures and inflation expectations. Starting in mid-2007 the exchange rate appreciated significantly (from 24 pesos per dollar in May 2007 to 19 pesos per dollar in July 2008). This appreciation of the exchange rate occurred despite a 10 percent of GDP increase in international reserves due to exchange rate interventions.

By the beginning of 2008 the inflationary situation had improved. Nevertheless, given the risk of additional pressure on domestic prices due to the evolution of international food and energy prices and the fact that core inflation measures were still above the inflation target, the Central Bank of Uruguay decided to kept the restrictive bias for monetary policy.

At that point (January 2008), the Committee of Macroeconomic Coordination decided to change the inflation target for the relevant policy horizon (June 2009) from a range of 4-6 percent to a range of 3-7 percent (Figure U4). This was done when inflation expectations for the monetary policy horizon reached 6.5 percent (Figure U7). After some reductions at the beginning of 2008, those expectations started to increase again in April 2008. During this period the Central Bank continued to intervene in the foreign exchange rate market.

In May 2008, the Central Bank decided to reinforce the restrictive stance of monetary policy by increasing the reserve requirements on short-term deposits. The Central Bank of Uruguay indicated that by changing the reserve requirements rather than the interest rate it was looking to make monetary policy more restrictive without introducing undesirable effects on the exchange rate.

3.6.2 The Lehman Period

The external shock caused the Uruguayan peso to depreciate by close to 30 percent between August and December 2008. This initial strong depreciation of the exchange rate did not have an adverse impact on balance sheets because of low leverage levels by the private sector (see Berkmen et al., 2009).

At the beginning of October, just after the collapse of Lehman Brothers, the Central Bank of Uruguay raised the policy interest rate from 7.25 percent to 7.75 percent (Figure U8). This was done in a context in which the economy grew 13.4 percent in annual terms in the third quarter of 2008 while inflation was close to 10 percent.

The global financial crisis generated an increase in sovereign risk, which reached around 700 basis points (Figure U9). At that point in time the authorities stressed there was no urgency to issue new debt, since the bulk of amortizations were to take place in 2026 or later. The authorities also indicated that their main objective at that time was the preservation of financial sector health. That implied preventing exchange rate depreciation from generating a financial crisis. The situation of the financial sector was very solid, with low leverage and plenty of reserves, mostly because the financial sector was just emerging from the banking crisis of 2002. The Central Bank of Uruguay nonetheless provided abundant dollar liquidity through the sale of reserves.

Somehow surprisingly, in this period of financial turmoil the Central bank of Uruguay chose to raise the interest rate repeatedly. In December of 2008, it raised the interest rate to 9.5 percent, and an additional increase to 10 percent occurred at the beginning of 2009. The Central Bank argued that inflation rates were still above the target and, in order to ensure convergence, a cut in the monetary policy stimulus was needed. Moreover, the depreciation of the exchange rate was a factor mentioned as one that justified the decision to increase the policy rate despite the negative external scenario.

In March of 2009 the Central Bank of Uruguay reversed its strategy by cutting the interest rate to 9 percent but keeping the contractionary bias. The Central Bank argued that the decrease in the inflation rate gave space for a cut despite keeping the real interest rate positive.

The economy quickly felt the effects of the global financial crisis, contracting 2.9 percent in the first quarter of 2009 (with respect to the last quarter of 2008). But economic growth resumed rapidly.

In June 2009 the inflation rate was within the inflation target zone. Given that inflation was decreasing and in order to keep the real rate stable, the Central Bank reduced the nominal interest rate to 8 percent. In December of 2009 the Comité de Coordinación Macroeconómica kept the inflation target in the policy horizon of 18 months at 5 percent while reducing the tolerance range to 1 percent (from 2 percent). The Central Bank again reduced the nominal interest rate to 6.25 percent so as to keep the real interest rate constant. In addition to the monetary policy rate cuts, the Central Bank reduced reserve requirements in 2009.

3.6.3 Developments since the Crisis

At the beginning of 2010 the possibility that actual inflation would not be consistent with the inflation target started to emerge. The economy was recovering rapidly from a mild recession in 2009, and during 2010 inflation expectations were above the upper limit of the inflation target zone. In response, in September 2010 the Central Bank increased the interest rate to 6.5 percent. By the end of 2010 was clear that aggregate demand was growing much faster than potential output, prompted in part by a sharp increase in local currency credit. Nevertheless, the Central Bank kept the monetary policy rate unchanged in December of 2010.

The Uruguayan economy grew an extraordinary 8.5 percent in 2010. During that year the Central Bank continued intervening in the foreign exchange rate market. Those interventions were sterilized using long-term bonds (Letras de Regulación Monetaria).

By March 2011 it was very clear that inflation was not being controlled, and inflation expectations were above the inflation target range. In this scenario the Central Bank raised the policy interest rate to 7.5 percent. In its communiqué, the Central Bank indicated that the perspective of reduction in the inflation rate were consistent with need to give continuity to the harmonious development of production, the competitiveness of domestic firms, the reduction in poverty and the improvement in income distribution.

Because of the inflation situation the Central Bank raised the monetary policy rate to 8 percent in June 2011. Earlier, in May 2011, marginal reserve requirements were created for deposits denominated in pesos and foreign currency. Average reserve requirements were increased on the same occasion. The Central Bank indicated that the purpose of these measures was "to prop up the monetary policy rate through the credit channel" in a context of inflationary pressures.

The Central Bank's idea was to increase the cost of funding and through this mechanism to reinforce the monetary policy channel. The bank indicated that this was even more important given that the Uruguayan economy was dollarized (with no control of the onshore dollar interest rate). It also indicated that this "prop-up" would not have a major impact on the exchange rate because it mostly affects the spread between the lending and deposit rates.

4. Learning from These Experiences

The recent experience of a group of countries in Latin America indicates that central banks of the region have used a wide variety of instruments to fulfill their goals. This has occurred in periods in which the monetary policy rate has been away from it slower bound. Therefore, the implementation of unconventional monetary policy has occurred in periods in which the monetary policy rate was "available" to be used in conventional fashion.

We center our analysis in the period from 2007 (before the September 2008 Lehman bankruptcy) until shortly after the crisis. The period previous to September 2008 was characterized by a rapid increase in inflation associated with high international food and energy prices, in a context of rapid growth in most of the economies under analysis fueled by strong terms of trade and rapid trading partners' growth. This period was also characterized by a significant appreciation of the exchange rate. Policy responses in this period vary but include:

- Increases in the monetary policy rate
- Programs of international reserves accumulation
- Exchange rate interventions
- Taxes on foreign purchases of fixed-income securities

The simultaneous increase in the inflation rate and appreciation of the exchange rate created some tension during this period. Despite the rapid increase in inflation central banks

were reluctant to let the exchange rate to appreciate in order to reduce inflationary pressures. Inflation expectations increased significantly and went above the inflation target in the corresponding monetary policy horizon, a sign of credibility loss.

The bankruptcy of Lehman Brothers in September 2008 was the starting point for a period of unprecedented monetary policy activism. The first part of the monetary policy responses in the region corresponded to measures to alleviate the financial tensions that domestic financial intermediaries were suffering. These measures included the following:

- Provision of international liquidity. Countries that had been accumulating reserves switched to dollar sales. Injections of international liquidity included foreign exchange swaps and the elimination of controls on short-term capital inflows.
- Reduction in reserve requirements.
- Increase in the maturity of discount loans.
- Widening of acceptable collateral for Central Bank operations.

Remarkably, the monetary policy response to the Lehman crisis did not include lowering the policy interest rate immediately. In fact, in some cases the policy rate was raised. Most central banks initiated a process of monetary policy rate cuts at the beginning of 2009. In some cases, this process was complemented with unconventional policy measures such as i) the explicit announcement regarding the course of the monetary policy rate in the future and ii) special lending facilities to the banking system.

The effects of the global financial crisis on economic activity and inflation were significant. Most of the countries under analysis went into to a process of rapid deceleration in economic growth and a significant fall in inflation. Nevertheless, the impact was clearly less persistent and damaging than in previous episodes of large external shocks. One key difference with previous episodes is that the health of the financial sector was kept intact. International liquidity provision was crucial to avoid lasting damage to the financial system.

Something else also helped to reduce uncertainty and to limit its negative effects on the real economy: the fact that central banks had ample space to implement “unconventional” measures to reduce the impact of the global financial crisis on the domestic economy. In particular, high levels of reserves and relatively limited stocks of short-term debt helped avoid

some of the bigger shocks to expectations associated with earlier episodes of financial turbulence.

After the crisis began to recede and capital flows were gradually restored, all countries quickly undid most of the measures adopted during the crisis. Indeed, if a credit crunch and a sharply depreciating exchange rate were problems shortly after Lehman, by early 2010 the problems were once again excessive credit growth and an overly strong currency. That is, the six nations under consideration returned to a pre-crisis state remarkably quickly. This was a contrast to earlier international crises in which the return to "normality" had been much slower. The speed of normalization this time around was partially due to the ample world liquidity and notably high international commodity prices that occurred in the aftermath of the crisis. But it was also due to the speed and boldness with which most monetary and fiscal authorities around Latin America reacted to this outsized external shock.

Yet before we declare these policy experiences unambiguously successful, it seems worthwhile to underscore a number of questions that, at least in our view, have yet to be answered. We list them here not in the hope of providing definitive answers ourselves, but rather to stimulate further research and analysis.

4.1 Responding to an Adverse Shock with an Interest Rate Hike

A notable feature of this episode, already noted above, is that all but one of the countries under consideration raised interest rates long after the crisis had begun in the United States, and only began cutting rates in early 2009 or thereabouts. Granted, 2007-08 was a period of surging commodity prices, higher domestic inflation and (in some countries) incipient overheating. But by the last quarter of 2008 it must have seemed evident that all these tendencies would quickly unwind themselves—as indeed they did.

That does raise the question, therefore, of whether a suitably forward-looking assessment of inflation risks would have called for a different interest-rate response in the course of 2008. The answer to this question will undoubtedly differ from country to country, but it still needs to be asked because, as we saw in the conceptual framework above, theory (at least as developed by Svensson), calls for *inflation forecast targeting* in a manner that is decidedly forward-looking.

An alternative interpretation is that central banks at least suspected the inflationary episode would quickly be unwound but felt that inflation expectations could become unanchored

if they failed to respond aggressively to the spike in prices. If put this way, then one must conclude that perhaps the Latin American central banks did not enjoy the credibility required to carry out IT in the manner prescribed by theory. This could be a function of the relatively short period of time IT had been in place in most of the countries in question.

4.2 Why the Credit Crunch?

An unsavory aspect of this episode is that, in spite of strong initial conditions, abundant reserves and well-regulated banks, as well as the aggressive unconventional response to the crisis by most central banks, credit slowed down considerably in most of the countries in question. A case in point is Chile, where in spite of the strong macroeconomic framework in place and the addition of an aggressive fiscal policy response (in addition to the strong monetary policy response) to the crisis, credit ground to a halt in the second half of 2008 and the first half of 2009. Calvo (2009) has emphasized this point for Chile and several other countries in the region.

One possible answer is that credit stopped because capital inflows stopped. But that only begs the question of why money stopped flowing to countries that were well managed and had strong banks and no obvious public or private debt problem.

Another alternative answer is that credit slowed down because interest policy was contractionary (as seen above) at the outset of the episode. But a short-lived increase in interest rates seems hard to square with a sudden stop in credit, especially since the rate hikes were soon followed by aggressive rate cuts everywhere.

If asked, Latin American bankers often claim that they stopped lending because credit demand collapsed. Aside from the standard identification problems, this also fails as a complete answer. If the economy was (plausibly) going to weather the shock, why would domestic firms and households stop demanding credit?

In short, a great deal more research seems warranted on this issue.

4.3 Interest Rates versus Reserve Requirements

A remarkable feature of this episode is the rediscovery of reserve requirements as a useful monetary policy tool. We say rediscovery, because they were extensively used before the 1990s, when they were mostly discarded.

One reason for not using reserve requirements is that they amount to an implicit tax, which could discourage intermediation. At the limit—think, for instance, of the Diamond-

Dybvig model—very high reserve requirements entirely eliminate the risk of runs and crises but also eliminate the benefits of financial intermediation. Another reason, as we saw at the outset, is that in the benchmark model there is nothing that non-conventional instruments (such as reserve requirements) can do that interest rate policy cannot do just as well.

By contrast, most Latin American policymakers used both instruments at the same time in the recent episode. The most common reason was that increasing rates would attract capital and appreciate the exchange rates, while raising reserve requirements would achieve the same target of curtailing credit without creating unwanted interest rate differentials.

But of course in the standard model that logic does not hold, because the policymaker is not free to set the quantity and the price of money at the same time. Some deviation from the standard model—a financial friction, most likely, or several—is necessary for the policymakers' logic to be consistent. Exactly what those frictions are, and what optimal policy is in their presence, is a promising topic for future research.

4.4 How Effective Was ER Intervention?

Many academic studies find that sterilized intervention has little impact on the nominal exchange rate and that the effects, such as they are, turn out to be far from persistent. At first sight, the same would seem to be the case here. Latin American currencies kept depreciating when fundamentals and expectations turned sour after Lehman, and they have mostly kept appreciating since the crisis, in spite of massive intervention by practically all the central banks in the region.

But needless to say, this informal evidence is far from enough to draw conclusions. For one, we do not know what the counterfactual would have been. Currencies would have been even stronger had they not sold dollars, most central bankers would claim. It seems to us their claim should be taken seriously and studied systematically. That is not only an empirical challenge (getting the econometrics right) but also a conceptual one: under what conditions prevalent today in Latin America would one expect interventions to be effective?

4.5 A New Regime or Simply IT Mark II?

Are countries in the region moving toward a new monetary policy framework? Or are they simply adding bells and whistles to the basic IT logic? We are inclined to take the second alternative. What seems to be emerging is not an alternative regime to IT, but rather an expanded and enriched version. The old IT may no longer be on target, but perhaps a new version soon will be.

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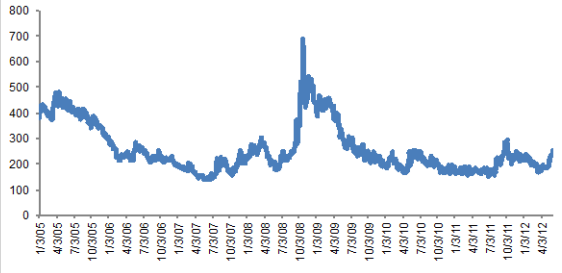
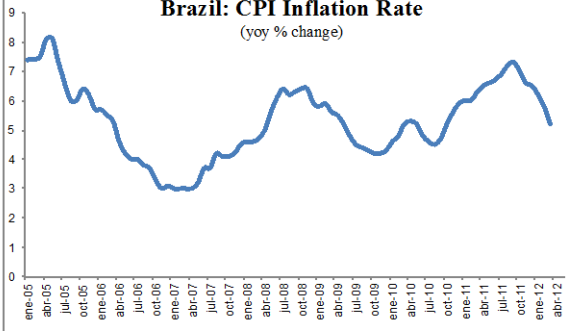
Figure B1
Brazil: EMBI+
(basis points)



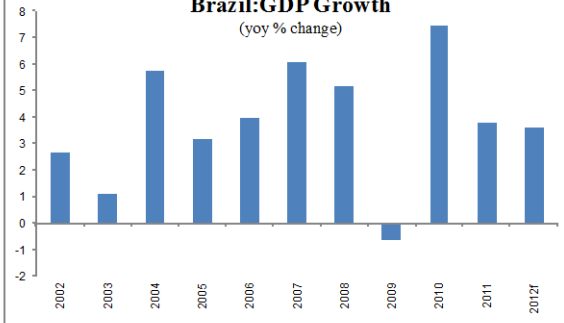
Source: JP Morgan Chase

Figure B2
Brazil: CPI Inflation Rate
(yoy % change)



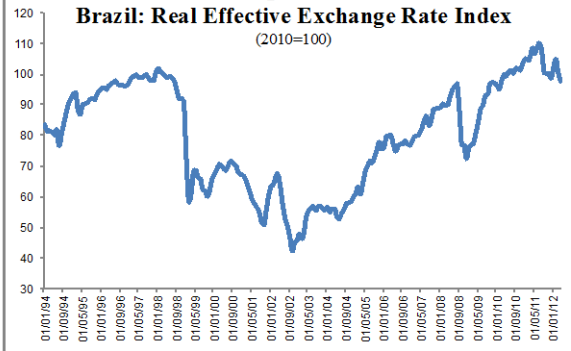
Source: Central Bank of Brazil

Figure B3
Brazil:GDP Growth
(yoy % change)



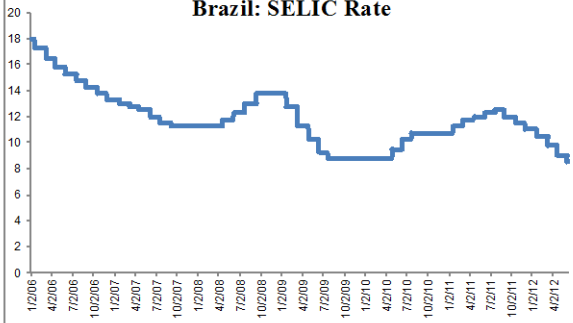
Source: World Economic Outlook, September 2011

Figure B4
Brazil: Real Effective Exchange Rate Index
(2010=100)



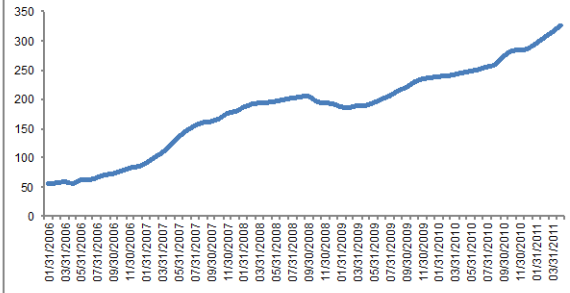
Source: Bank of International Settlements

Figure B5
Brazil: SELIC Rate



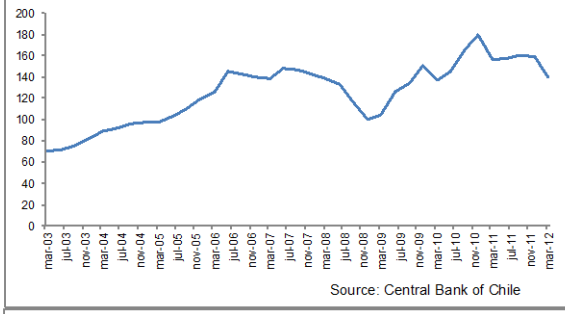
Source: Central Bank of Brazil

Figure B6
Brazil: Net Foreign Reserves
(Billions US$)



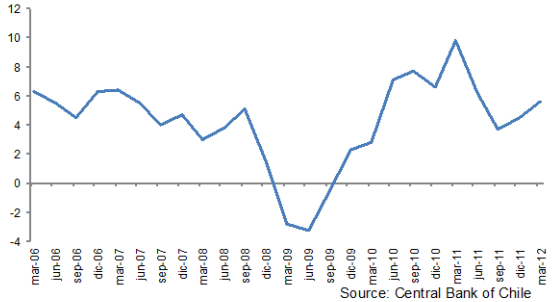
Source: Central Bank of Brazil

Figure CL1
Chile: Terms of Trade Index
(Dec. 2008=100)



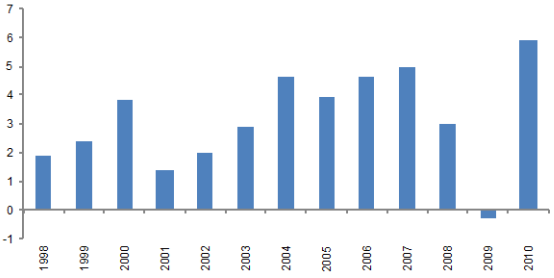
Source: Central Bank of Chile

Figure CL2
Chile: GDP Growth
(yoy % change)



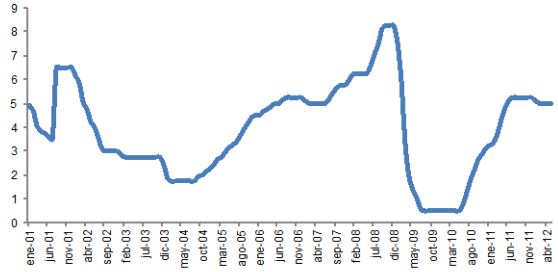
Source: Central Bank of Chile

Figure CL3
Chile: Trade Partners Growth
(yoy % change)



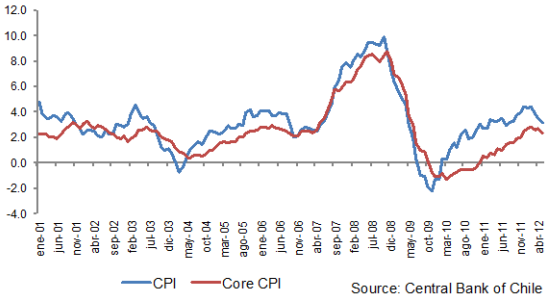
Source: Central Bank of Chile

Figure CL4
Chile: Monetary Policy Rate



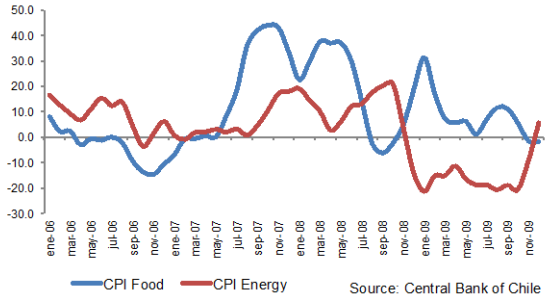
Source: Central Bank of Chile

Figure CL5
Chile: CPI Inflation
(yoy % change)



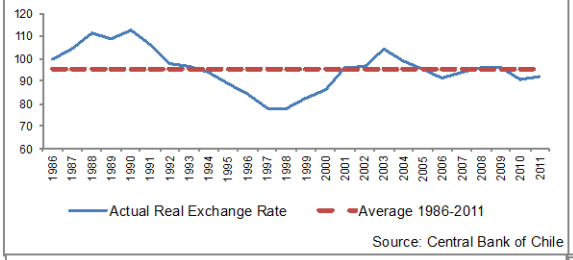
Source: Central Bank of Chile

Figure CL6
Chile: Food and Energy Prices
(yoy % change)



Source: Central Bank of Chile

Figure CL7
Chile: Real Exchange Rate
(1986=100)



Source: Central Bank of Chile

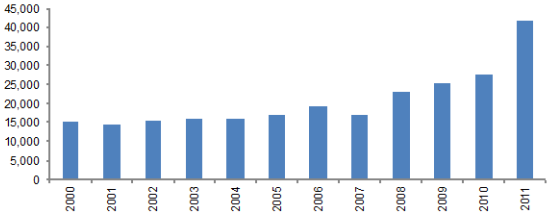
Figure CL8
Chile: Nominal Exchange Rate
(Pesos per USD)

Source: Central Bank of Chile

Figure CL9
Chile: Inflation Expectations
(within 23 months)

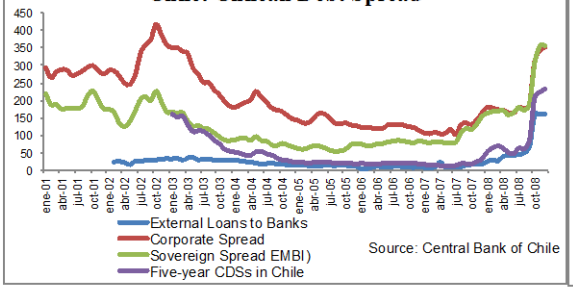
Source: Central Bank of Chile

Figure CL10
Chile: International Reserves
(millions USD)



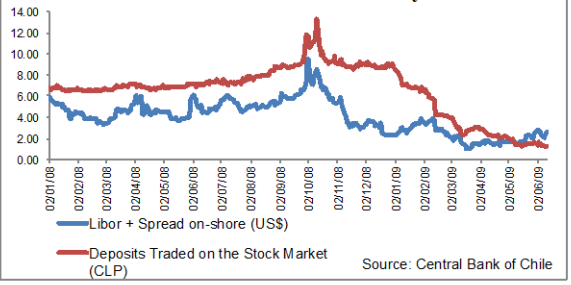
Source: Central Bank of Chile

Figure CL11
Chile: Chilean Debt Spread



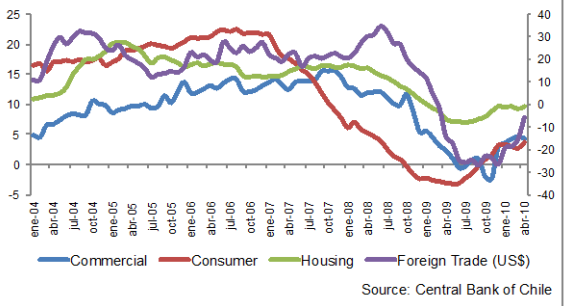
Source: Central Bank of Chile

Figure CL12
Chile: Local USD and CLP 90 Day Rates



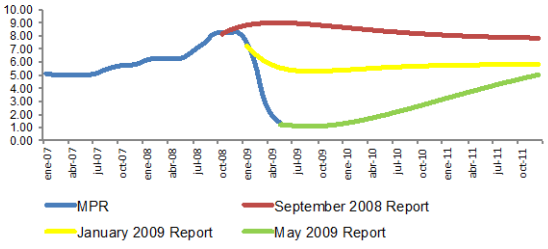
Source: Central Bank of Chile

Figure CL13
Chile: Real Growth of Loans
(yoy % change)



Source: Central Bank of Chile

Figure CL14
Chile: Monetary Policy Rate and the Forward Curve
(percent)



Source: Central Bank of Chile

Figure CL15A
Chile: Expectations for the MPR and Unconventional Monetary Policy
(percent)

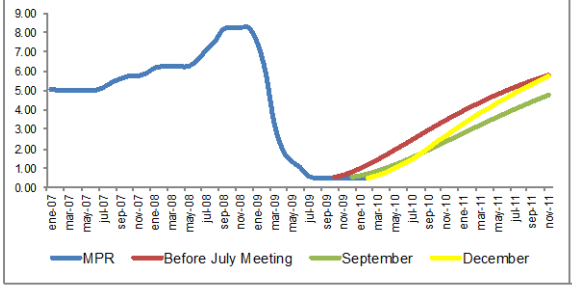


Figure CL15B
Chile: Expectations for the MPR and Unconventional Monetary Policy
(percent)

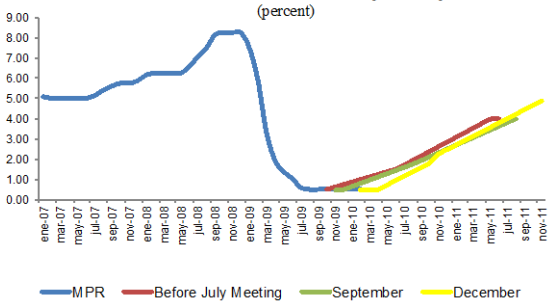
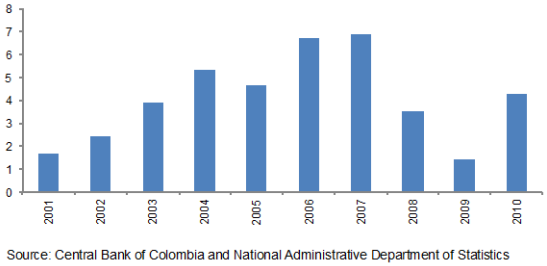
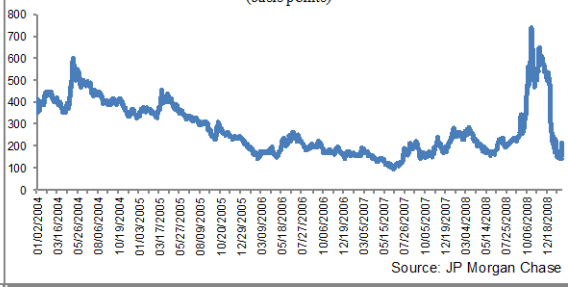


Figure C1
Colombia: GDP Growth
(GDP at 2005 Prices, Annual Growth)



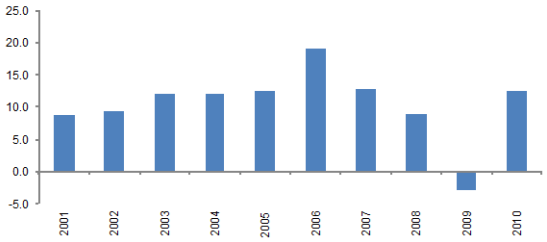
Source: Central Bank of Colombia and National Administrative Department of Statistics

Figure C2
Colombia: EMBI+
(basis points)



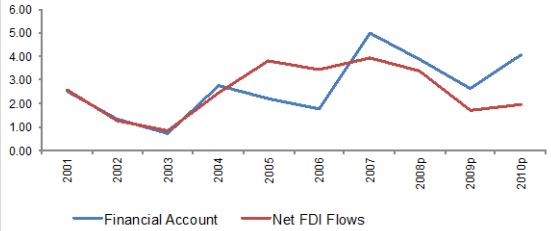
Source: JP Morgan Chase

Figure C3
Colombia: Investment Growth
(annual % change)



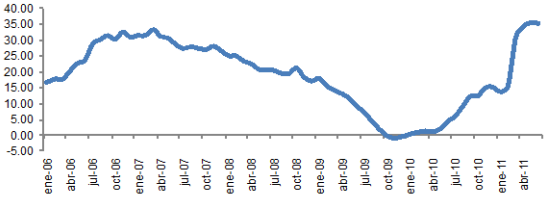
Source: Central Bank of Colombia

Figure C4
Colombia: Financial Account and FDI
(% of GDP)



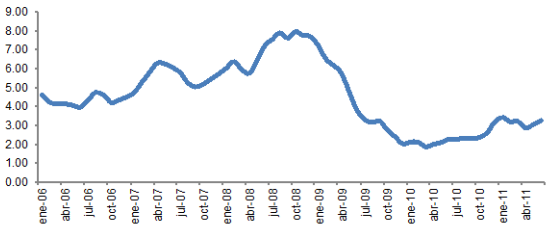
Source: Central Bank of Colombia

Figure C5
Colombia: Credit of Financial System to Private Sector
(yoy % change)



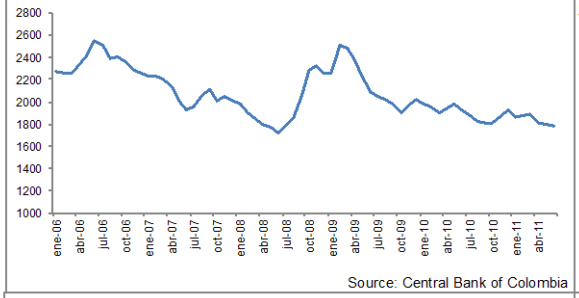
Source: Central Bank of Colombia

Figure C6
Colombia: CPI Inflation
(yoy % change)



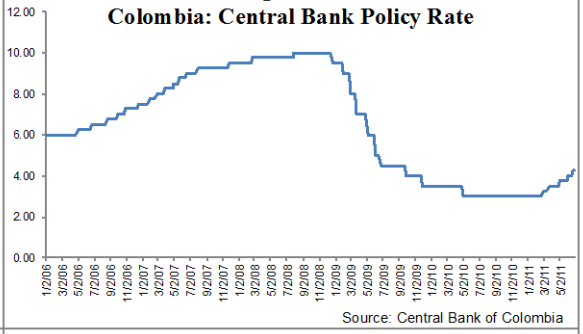
Source: National Administrative Department of Statistics

Figure C7
Colombia: Exchange Rate



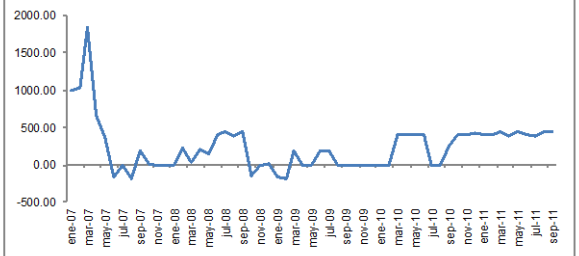
Source: Central Bank of Colombia

Figure C8
Colombia: Central Bank Policy Rate



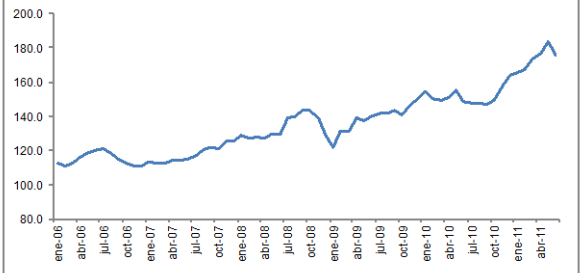
Source: Central Bank of Colombia

Figure C9
Colombia: Foreign Exchange Intervention
(US$ Millions)



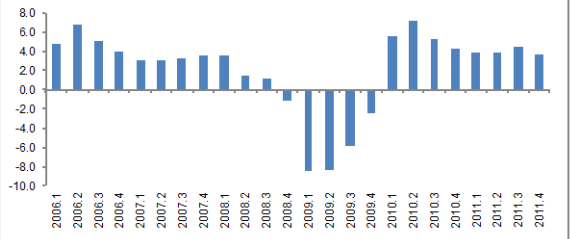
Source: Central Bank of Colombia

Figure C10
Colombia: Terms of Trade



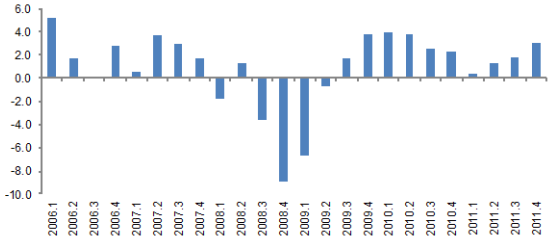
Source: Central Bank of Colombia

Figure M1
Mexico: GDP Growth
(yoy % change)



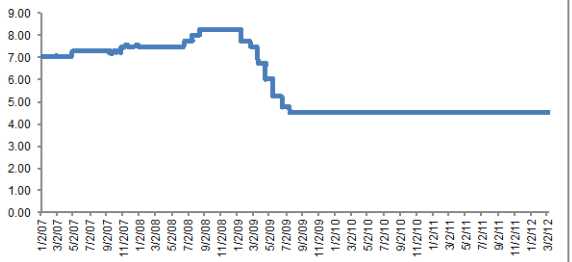
Source: Central Bank of Mexico

Figure M2
Mexico: USA GDP Growth
(annualized quarter on quarter growth rate)



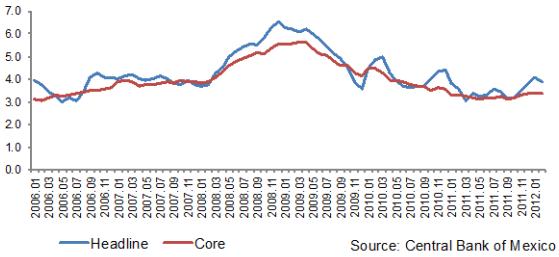
Source: Bureau of Economic Analysis

Figure M3
Mexico: Monetary Policy Rate



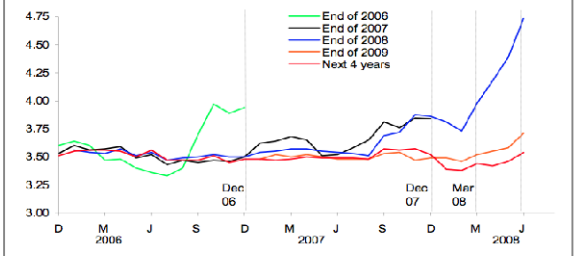
Source: Central Bank of Mexico

Figure M4
Mexico: Inflation Rate
(yoy % change)



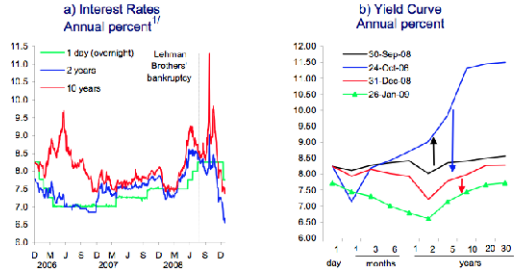
Source: Central Bank of Mexico

Figure M5
Mexico: Annual Headline Inflation Expectations



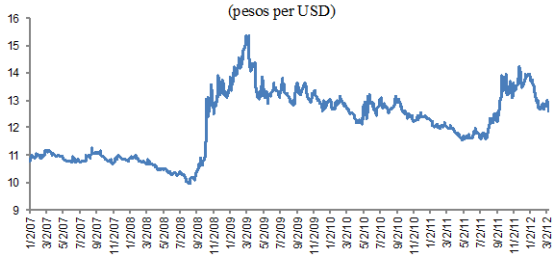
Source: Central Bank of Mexico

Figure M6
Mexico: Interest Rates



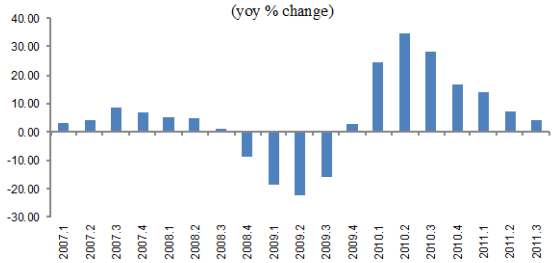
Source: Central Bank of Mexico

Figure M7
Mexico: Nominal Exchange Rate
(pesos per USD)



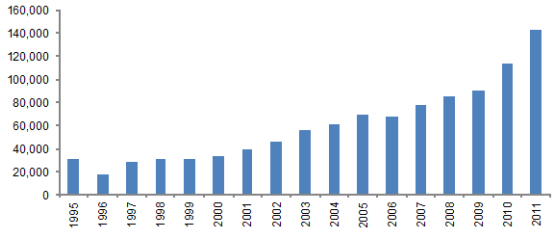
Source: Central Bank of Mexico

Figure M8
Mexico: Exports Growth
(yoy % change)



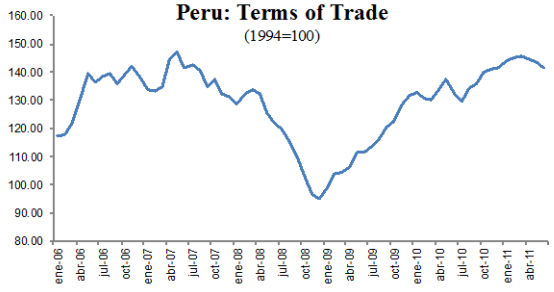
Source: Central Bank of Mexico

Figure M9
Mexico: International Reserves
(millions USD)



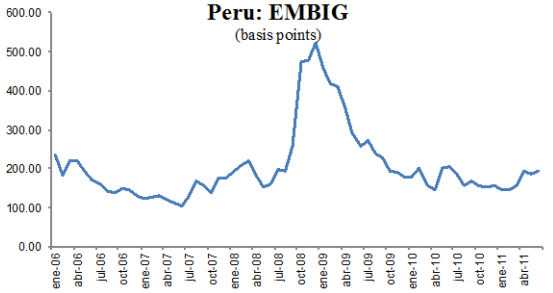
Source: Central Bank of Mexico

Figure P1
Peru: Terms of Trade
(1994=100)



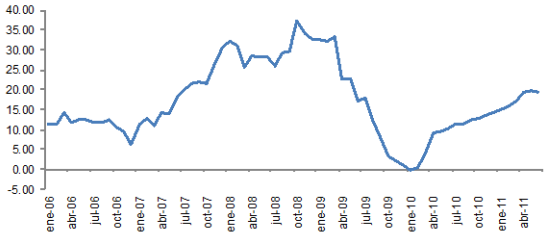
Source: Central Bank of Peru

Figure P2
Peru: EMBIG
(basis points)



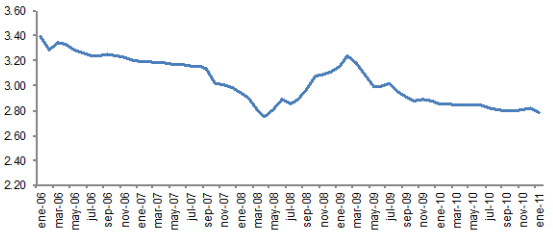
Source: JP Morgan Chase

Figure P3
Peru: Bank Credit to Private Sector
(yoy % change)



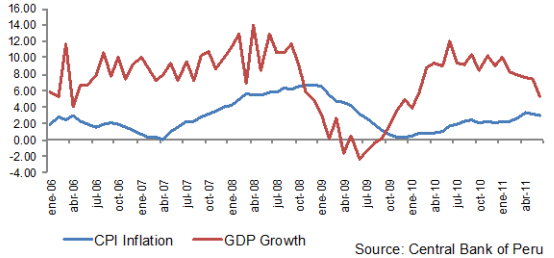
Source: Central Bank of Peru

Figure P4
Peru: Nominal Exchange Rate
(sol per USD)



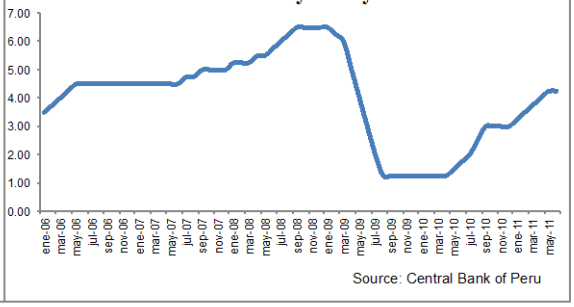
Source: Central Bank of Peru

Figure P5
Peru: CPI Inflation and GDP Growth
(annual percentage change)



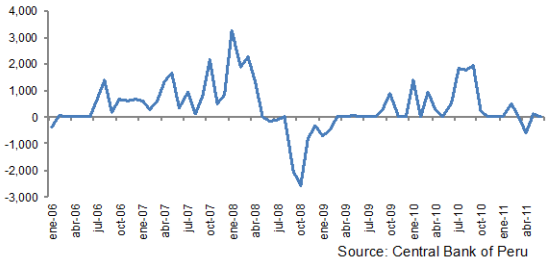
Source: Central Bank of Peru

Figure P6
Peru: Monetary Policy Rate



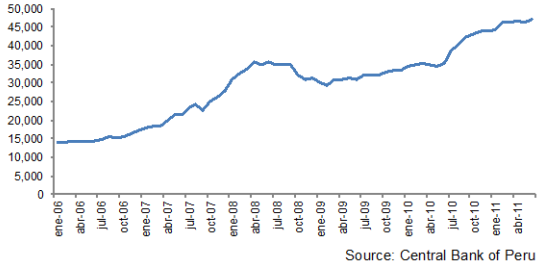
Source: Central Bank of Peru

Figure P7
Peru: Central Bank Dollar Purchases
(US$ Million)



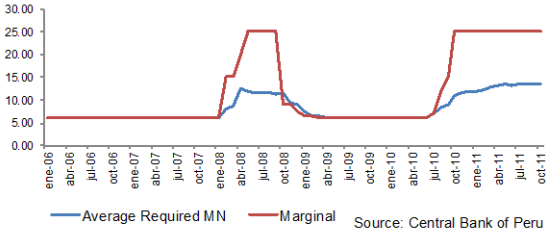
Source: Central Bank of Peru

Figure P8
Peru: Net Foreign Reserves
(US$ Million)



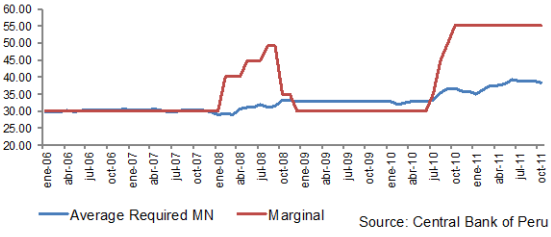
Source: Central Bank of Peru

Figure P9
Peru: Reserve Requirements in Domestic Currency
(percentage points)



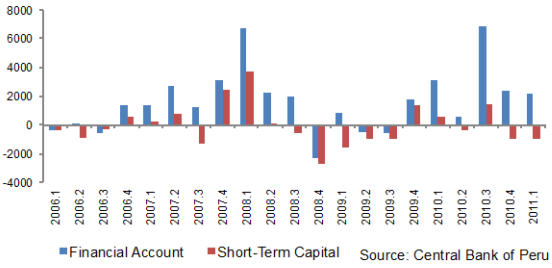
Source: Central Bank of Peru

Figure P10
Peru: Reserve Requirements in Foreign Currency
(percentage points)



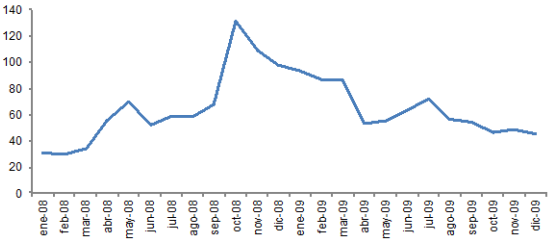
Source: Central Bank of Peru

Figure P11
Peru: Financial Account and Short-Term Capital
(Million USD)



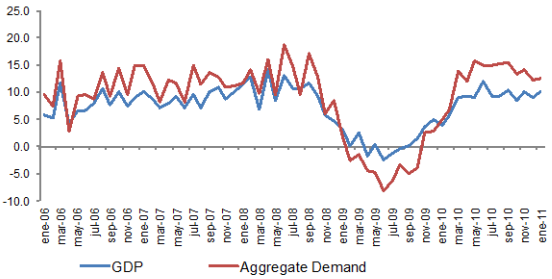
Source: Central Bank of Peru

Figure P12
Peru:Spread of the Prime 90 Day Lending Rate and the Central Bank Policy Rate
(basis points)



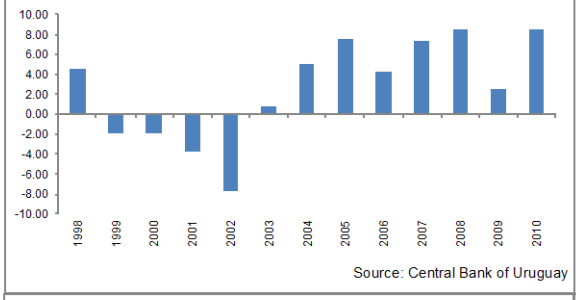
Source: Central Bank of Peru

Figure P13
Peru: Production and Aggregate Demand
(yoy % change)



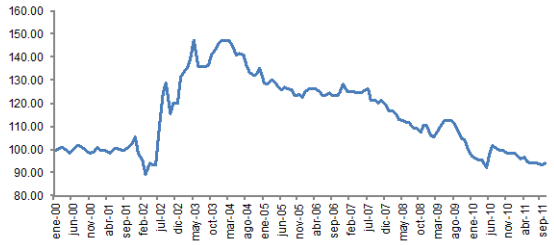
Source: Central Bank of Peru

Figure U1
Uruguay: GDP Growth



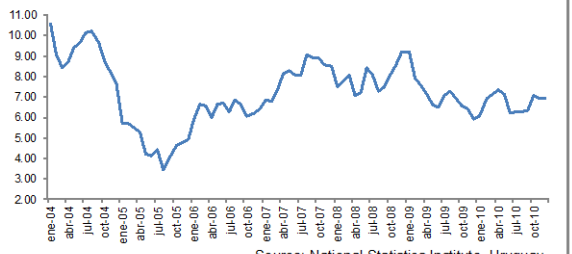
Source: Central Bank of Uruguay

Figure U2
Uruguay: Real Exchange Rate Index
(2000=100)



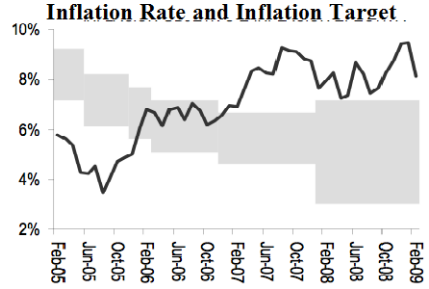
Source: Central Bank of Uruguay

Figure U3
Uruguay: Inflation Rate
(yoy % change)



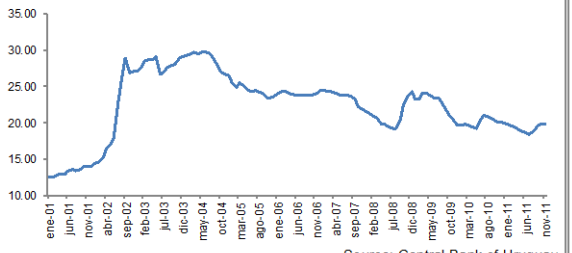
Source: National Statistics Institute, Uruguay

Figure U4
Inflation Rate and Inflation Target



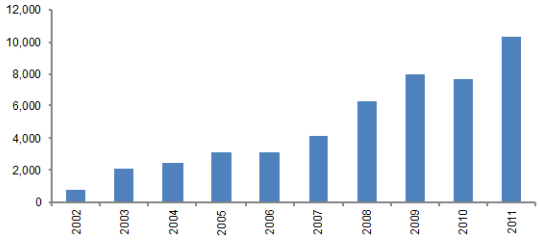
Source: Central Bank of Uruguay

Figure U5
Uruguay: Nominal Exchange Rate
(Pesos per USD)

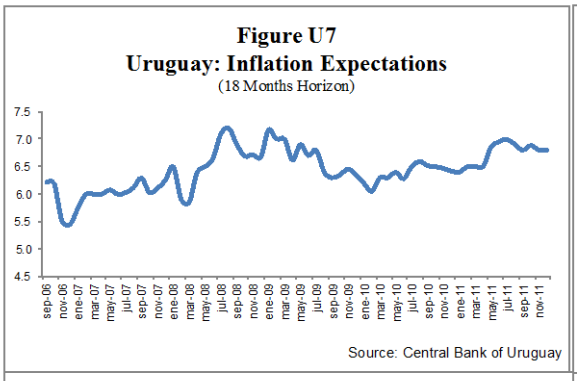


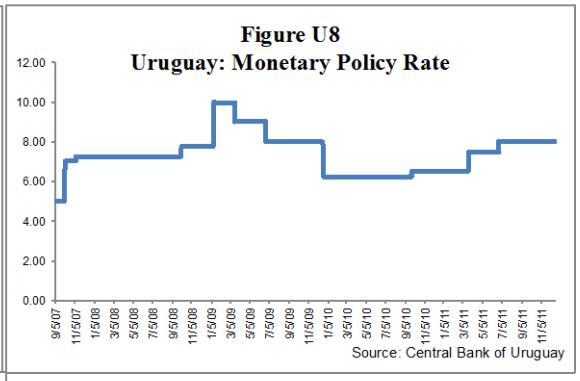
Source: Central Bank of Uruguay

Figure U6
Uruguay: International Reserves
(US$ Million)



Source: Central Bank of Uruguay





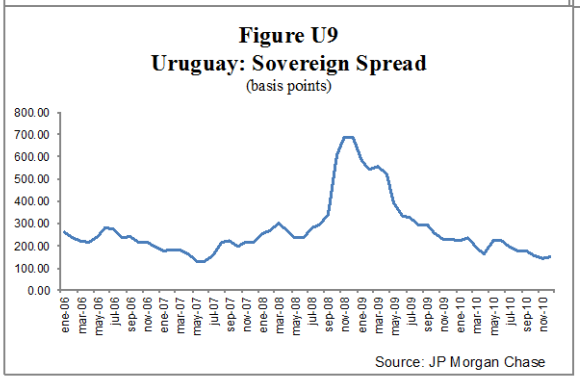


Table CL1.
Chile: Dollar Swaps Operations

Date	Maturity (days)	Amount Offered (US$ million)	Amount Purchased (US$ million)	Weighted Spread Premium (percent)
30 Sept. 08	28	500	388	3.49
07 Oct. 08	28	500	30	3.06
14 Oct. 08	91	500	200	1.07
21 Oct. 08	63	500	150	1.04
28 Oct. 08	91	500	67	1.10
04 Nov. 08	63	500	227	1.09
11 Nov. 08	91	500	15	1.06
18 Nov. 08	63	500	100	1.06
25 Nov. 08	91	500	200	1.20
02 Dec. 08	182	500	160	1.06
09 Dec. 08	182	500	0	-
16 Dec. 08	182	500	0	-

Source: Central Bank of Chile.

Table CL2.
Chile: Dollar Deposit Auctions by the Treasury

Date	Maturity (days)	Amount Auctioned (US$ million)	Amount Sold (US$ million)	Sale Interest Rate (*) (percent)
12 Nov. 08	91	350	332	3.27
19 Nov. 08	119	368	368	3.50

(*) Weighted interest rate of sales (LIBOR+spread)

Source: Central Bank of Chile.

Table P1.
Peru: Selected Balance of Payments Items (% of GDP)

	2004	2005	2006	2007	2008	2009	2010
Current Account Balance	0.0	1.4	3.1	1.4	-4.2	0.2	-1.5
Goods and Services	4.3	6.7	9.7	7.9	2	4.7	4.4
Exports (FOB)	18.4	21.9	25.8	26.1	24.4	21.2	23.1
Imports (FOB)	-14.1	-15.2	-16.1	-18.2	-22.4	-16.5	-18.7
Financial Account	3.1	0.2	0.4	7.8	6.8	1.2	8.4
Private Sector	1.3	2.3	2.3	8.2	7.5	2.1	8.7
Public Sector	1.4	-1.8	-0.8	-2.3	-1.1	0.8	-0.7
Short-Term Capital	0.3	-0.3	-1.2	1.9	0.4	-1.7	0.4

Source: Central Bank of Peru.