International Monetary Fund

Financial Dollarization

The Policy Agenda

edited by
Adrián Armas, Alain Ize
and Eduardo Levy Yeyati

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List of Abbreviations

AECM	Aggregate effective currency mismatch
ALM	Asset-liability management
AMC	Asset management company
BCB	Central Bank of Bolivia
BCBS	Basel Committee on Banking Supervision
BCC	Central Bank of Chile
BCPR	Bank credit to private sector
BCRP	Central Reserve Bank of Peru
BHU	Banco Hipotecario del Uruguay
BIS	Bank for International Settlements
BOE	Bank of England
BROU	Banco de la República Oriental del Uruguay
CACs	Collective action clauses
CAPM	Capital asset pricing model
CAR	Capital adequacy ratio
CBRs	Circuit breakers
CCAPM	Consumption capital asset pricing model
CCL	Contingent credit line
CD	Certificate of deposit
CDRs	Exchange rate-indexed securities
CGFS	Committee on the Global Financial System
CND	Corporación Nacional para el Desarrollo
CPI	Consumer price index
DMO	Debt Management Office
DQAF	Data Quality Assessment Framework
EMBI	Emerging Market Bond Index
ER	Exchange rate
EU	European Union
FCDs	Foreign currency deposits
FD	Financial dollarization
FF	US Federal Fund rate
FFBS	Fund for Fortifying the Banking System
FFCT	Fear of floating competitiveness targeting
FFIT	Full-fledged inflation targeting
FLAR	Latin American Reserve Fund
FRNs	Floating rate notes
FSBS	Fund for Stability of the Banking System
FX	Foreign exchange
GDP	Gross domestic product

GMM	Generalized method of moments
HICP	Harmonized index of consumer prices
IADB	Inter-American Development Bank
IAS	International Accounting Standard
IFIs	International financial institutions
IFRS	International Financial Reporting Standards
IFS	International Financial Statistics
IG GEMMS	Index-linked Gilt edged market makers
IIT	Intermediate inflation targeting
IMF	International Monetary Fund
IS	Investment-savings
IT	Inflation targeting
LARs	Liquid asset requirements
LFT	Letras Financieras do Tesouro
LIBOR	London Inter Bank Offering Rate
LOLR	Lender of last resort
MFD	Monetary and Financial Systems Department
MVP	Minimum variance portfolio
NBC	New Banco Comercial
NER	Nominal exchange rate
NFCA	Net foreign currency assets
NIR	Net international reserves
NPLs	Non-performing loans
NTN	Notas do Tesouro Nacional
OAT	Obligations assimilables du Trésor
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary least squares
OPP	Office for Planning and Budgeting
PR	Pakistani rupee
PRS	Political risk rating
QPM	Quarterly projection model
REER	Real effective exchange rate
SBP	State Bank of Pakistan
SDDS	Special Data Dissemination Standards
SDR	Special drawing right
TB	Treasury bills
TIIS	Treasury inflation-indexed debt
UF	Unidad de fomento
UFV	Unidad de fomento de la vivienda
UIRP	Uncovered interest rate parity
UR	Unidades reajustables
VAR	Vector autoregressive
VAT	Value added tax
WEO	World Economic Outlook

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Foreword

Óscar Dancourt and Stefan Ingves

The materials in this book gather the proceedings of a conference held in Lima, Peru, during 21–22 April 2005 on 'The Policy Implications of De Facto Dollarization'. The conference was jointly organized by the Central Reserve Bank of Peru (BCRP) and the Monetary and Financial Systems Department (MFD) of the International Monetary Fund (IMF). It originated from a desire by the Peruvian authorities to share with other countries in the region their rather unique experience as inflation targeters in a highly dollarized environment and, more generally, compare notes on how to deal with dollarization and its risks. The conference brought together practitioners, policy-makers and academics who, through research or work in the field, have had a first-hand opportunity to think about the root causes of dollarization and its policy implications. It was attended by representatives from most (if not all) regional central banks, ministries of finance and supervisory institutions, as well as representatives from several multilateral institutions, including the World Bank, the Bank for International Settlements (BIS), the Inter-American Development Bank (IADB) and the Latin American Reserve Fund (FLAR), in addition to a sizable contingent from the IMF.

The time appears to be ripe for an in-depth review of the policy implications of financial dollarization. Notwithstanding declining, and often quite low, rates of inflation, de facto dollarization has continued to rise (or failed to decline) in most regions of the world, most particularly in Latin America. At the same time, following a number of recent crises episodes where dollarization played an important role, most notably in Asia and Latin America, the view of de facto dollarization as a mostly benign and, on the whole, beneficial phenomenon, has given way to more sobering thoughts. Indeed, the recent Argentinian crisis and its tidal waves throughout the region brought home the realization that dollarization can be a major source of financial fragilities. It can induce liquidity crises and undermine the solvency of banks and their borrowers in the event of large depreciations when most loans, even to those sectors that do not earn dollars, are in dollars. Concerns about the financial impact of exchange rate fluctuations can, in turn, hold monetary policy hostage and greatly complicate crisis management when crises occur.

The range of policy responses to dollarization and its underlying causes has been quite varied, increasingly proactive and, in many cases, seemingly successful. Comparing notes on such experiences and sharing lessons is indeed a key objective of this book. The experience of the few countries like Israel that have largely de-dollarized based on good and persistent monetary management provides, of course, a key point of reference. But good monetary management and a shift towards more exchange rate flexibility appear to have also paid off in countries that remain highly dollarized, such as Peru, Bolivia, Uruguay and Paraguay. Attempts to reign in dollarization through more aggressive methods, both in the

region and outside the region, are also worth looking into. At the same time, many countries have innovated in terms of how to conduct monetary policy under a highly dollarized environment and limit the prudential risks of high dollarization. While the Peruvian experience of formal inflation targeting with an interest rate as an operative target is rather unique, several other countries, including Bolivia and Uruguay, also have interesting experiences to share in this respect. Several countries in the region have also recently reviewed (or are in the process of reviewing) their prudential framework to better assess and internalize the risks of intermediating in foreign currency.

Last but not least, there has been substantial progress in the academic literature on dollarization in recent years, both of a theoretical and empirical nature, that helps understand the root causes of dollarization and its linkages with monetary and prudential policies. Together with a greater awareness of the need for policy reform, fully grasping the intricacies of the phenomenon at hand is, of course, a key prerequisite for policy action.

While there are some good reasons for optimism, one needs to remain cautious about the perspectives for de-dollarization and mindful, when formulating a policy agenda, that one size may not fit all. In particular, de-dollarizing only becomes an option when the weak macroeconomic and institutional background that has led to dollarization has made a sufficient turnaround that it can now support a 'good-quality' local money that is well equipped to compete with imported ones. In some cases, the policy agenda may need to limit its focus to living with dollarization and containing its risks. In other cases, the preferable policy may be to promote dollar substitutes, such as price-indexed instruments, until the local currency is better able to compete head to head with the dollar. In all cases, good coordination between all policy-makers involved, including central banks, supervisory agencies and ministries of finance, is likely to be crucial in ensuring the successful design and implementation of the policy agenda.

The chapters in this volume do not pretend to have all the policy answers to an inherently complex and multifaceted phenomenon. The aim of the book is mainly to provide a solid reference piece to help guide the policy response to an issue which is likely to remain high on the agenda for years to come.

1
Financial Dollarization: An Overview

Adrián Armas, Alain Ize and Eduardo Levy Yeyati

1.1 Introduction

This volume presents a collection of essays, comments and discussions on the roots, risks and policy implications of de facto financial dollarization. The book's analysis and conclusions are founded in an extensive survey of the theoretical and empirical literature – as well as original contributions – on the causes and risks of financial dollarization. Based on these insights and a close review of some country case studies, the book draws lessons for policy management in highly dollarized environments.

The policy agenda is quite broad. It covers: (i) *macro management,* mainly monetary policy but also fiscal policy and public debt management; (ii) *prudential management,* particularly how to limit the financial sector's vulnerability to currency-induced credit risk and liquidity risk; (iii) *crisis management,* including how to attenuate the cost and likelihood of a liquidity crisis; and (iv) *de-dollarization policies,* in particular whether market-friendly measures (such as price indexation) are sufficient to promote the use of the local currency, or whether more aggressive actions are needed to fully internalize dollarization risks and discourage the use of the foreign currency.

In this introductory chapter, we briefly review the main themes covered in the book. Following the book's structure, our overview is organized into four sections. Section 1.2 provides a bird's eye view of the theory and evidence on the roots of financial dollarization. Sections 1.3 and 1.4 survey the main issues faced by the monetary and prudential authorities in a dollarized economy. Section 1.5 sums up the discussion on the scope for de-dollarization and reviews alternative routes towards this end. Section 1.6 concludes by summing up the main steps and challenges looking forward.

1.2 What causes dollarization?

The roots of financial dollarization are extensively discussed in the general analytical framework presented by Ize in Chapter 2 and the broad survey of the literature by Ize and Levy Yeyati in Chapter 3. The main finding of these chapters is that financial

dollarization is the result of a market equilibrium in which both the suppliers and the demanders of funds choose an optimal currency composition. In this process, three basic drivers emerge: (i) the *maximization of return volatility* (in the presence of risk aversion) favours the currency that is more stable and credible, particularly over the longer run; (ii) the *minimization of credit risk* favours the currency that minimizes the probability of default (in the case of a single creditor or perfect information) or the loss-given default (in the case of multiple creditors and imperfect information); and (iii) the *maximization of the option value of bail-out or deposit guarantees* promotes moral hazard-driven equilibria in which the preferred currency is that which maximizes expected costs to the insurer. Dollarization will therefore tend to prevail in environments where monetary policy is perceived to be weak (increasing the volatility of real returns on local currency assets), and geared towards limiting exchange rate fluctuations (reducing the risk of foreign currency lending relative to local currency lending); and where foreign currency depositors and borrowers expect the government to come to their rescue in the event that a large devaluation cannot be avoided.

Chapter 2 offers a number of key additional insights regarding how monetary policy interacts with different sources of dollarization. In particular, it breaks down the problems affecting monetary policy into three interrelated, yet conceptually distinct, components: (i) lack of credibility; (ii) exchange rate smoothing (fear of floating); and (iii) policy asymmetry and overvaluation (as a result of a not fully credible exchange rate smoothing, the nominal exchange rate is not allowed to appreciate in good times but is expected to depreciate in bad times). The chapter shows that lack of credibility, as reflected in the expected pass-through of exchange rate devaluations on prices, has a dual role. Under risk aversion-driven dollarization, the pass-through defines the currency mix that minimizes the volatility of real returns in investors' portfolios, i.e., the minimum variance portfolio (MVP), while under credit risk-driven dollarization, it defines the debt mix that minimizes firms' currency mismatches.

However, a sizable local currency premium (resulting from an overvalued domestic currency and an asymmetric monetary policy) may allow the dollar to dominate the MVP under the credit risk paradigm. Moreover, when fear of floating reflects concerns for the financial fragilities associated with a highly dollarized economy, monetary policy can fall hostage to dollarization and multiple equilibria become possible. High dollarization triggers high fear of floating, limiting the risk of foreign currency lending and validating the preference for the foreign currency. Instead, low dollarization enables the monetary authorities to follow a more flexible exchange rate policy, limiting the risk of local currency lending and triggering a preference for the local currency.

Under the moral hazard paradigm, fear of floating similarly induces a preference for the foreign currency because it allows banks (and borrowers) to benefit from cheap funding under the likely outcome in which the exchange rate is maintained, and to discount the unlikely outcome in which the exchange rate is devalued and banks lose their capital. Multiple equilibria, underpinned by a range of capital values for which a low and a high dollarization equilibrium exists, also become possible when monetary policy is endogenous to dollarization.

Chapter 3, in turn, stresses that dollarization may reflect policy or market failures. Policy failures occur when the monetary or prudential authorities cannot precommit to maintain stable prices, let the exchange rate float, or avoid bailouts in a crisis. In such cases, dollarization is an outcome of agents' optimal response to a suboptimal economic environment. On the other hand, market failures occur when poor market information lead to coordination failures in which individual creditors have an incentive to deviate from the social optimum. Market asymmetries, such as deeper or more efficient dollar markets, or more effective offshore legal frameworks, can also promote the use of the dollar, a point which the recent Costa Rican experience illustrates, as explained by Francisco de Paula Gutierrez in Chapter 13. Indeed, such asymmetries, in part associated with network effects and increasing returns to scale, underlie much of the 'original sin' literature which, unlike the papers in this book, focuses nearly exclusively on financial equilibria between residents and non-residents in the context of international markets.

Empirical contributions on the sources of dollarization, summarized in Chapter 3, provide broad-based support for the MVP view. The estimates presented by Robert Rennhack and Masahiro Nozaki in Chapter 4 corroborate earlier results, with a 10 per cent increase in the MVP translating into a 5 per cent increase in deposit dollarization. Rennhack and Nozaki also find, as do other studies, that various indicators of institutional quality contribute to explaining deposit dollarization. However, they find that these variables are no longer significant when OECD countries are excluded, suggesting that significant gains in institutional quality are needed to bolster confidence in the currency.

Rennhack and Nozaki also test for credit risk-induced dollar dominance by using, as proxies for the local currency premium, two measures of monetary policy asymmetry. The results are mixed. A bias measure, that assigns a higher value to months of currency depreciation than to months of currency appreciation, is found to be significant. However, an alternative measure, based on the skewness of the distribution of currency depreciations (to reflect the fact that dollarized countries that have experienced bouts of high inflation and high depreciation should have more skewed distributions with longer upper tails) fails to produce significant results. An analysis along similar lines, albeit not econometrically backed, is presented by Hardy and Pazarbasioglu in Chapter 11 to illustrate and contrast the exchange rate history of countries with high and low dollarization.

However, as underlined by Roberto Chang in his comments on Chapter 3, further efforts are needed to fully identify the root causes and dynamics of dollarization. In particular, policy endogeneity adds a crucial layer of complication in identifying the proper direction of causality between monetary policy and dollarization, a healthy reminder of the limitations faced in testing some of the analytical results, and of the caution needed while extrapolating policy conclusions from theoretical paradigms. A similar note of caution can be drawn from Olivier Jeanne's comments on Chapter 2, where he shows that in some instances fear of floating, by limiting the local currency premium, could promote the local currency rather than the foreign currency.

1.3 Monetary management in highly dollarized economies

Ize and Levy Yeyati in Chapter 3, and Rennhack and Nozaki in Chapter 4, stress that dollarization has not been an impediment towards price stability. Dollarized countries are doing as well, if not better, than non-dollarized countries in terms of inflation. However, as noted by Juan Antonio Morales in Chapter 13, this good performance has generally been based on an exchange rate anchor. Rennhack and Nozaki illustrate the point by showing that dollarized countries in Latin America exhibit much less exchange rate flexibility than non-dollarized countries.

This last point is elaborated on by Leonardo Leiderman, Rodolfo Maino and Eric Parrado in Chapter 5. They show that monetary reaction functions in some highly dollarized Latin American countries differ significantly from those of the non-dollarized countries used as benchmarks. While central banks in dollarized countries are also concerned about inflation, they target the nominal exchange rate much more closely. In some cases, they use the nominal exchange rate, instead of the interest rate, as the primary operational target. In addition, they intervene more heavily in the foreign exchange market and let international reserves (rather than the exchange rate) play a more active role as the main front-line buffer against shocks.

Two key questions therefore emerge: (i) does the rigidity of the exchange rate regime have significant costs in terms of monetary or prudential management? And (ii) how can dollarized countries migrate from exchange rate anchoring to inflation targeting?

As regards the first question, a more rigid exchange rate regime should in principle limit the countercyclical capacity of monetary policy. However, while there is some evidence of higher output volatility in dollarized countries, it is not overwhelming. Ize and Levy Yeyati argue in Chapter 3 that the main drawback of exchange rate rigidity is more indirect. By promoting dollarization, it makes the financial sector more fragile (through balance sheet effects) and limits the monetary authorities' capacity to deal with large liquidity crises and real shocks. This conclusion is supported by the statistical work of Chapters 6 and 7 that demonstrates that the quality of loan portfolios in dollarized economies deteriorates rapidly under an exchange rate depreciation. The importance of currency mismatches in disrupting financial contracts is also emphasized in Chapter 12 by Philip Turner, who proposes a simple and operationally attractive measure of mismatch-induced vulnerability, based on the ratio of the currency denomination of debt to the share of tradables in GDP.

This being said, it is important to remember that financial dollarization is often (albeit not always) an optimal risk management response to the policy environment in which economic agents operate. Hence, as stressed by Ize in Chapter 2 and Kevin Cowan in his comments on Chapter 4, financially dollarized economies may be only vulnerable to the extent that they become exposed to large unexpected regime changes. It also follows that forced de-dollarization is unlikely to reduce risk unless it is accompanied by a concomitant change in the policy regime.

As regards the second question, Armas and Grippa in Chapter 6 make a quite compelling case, based on Peru's recent experience, for the feasibility and benefits

of adopting an inflation-targeting framework in a dollarized economy. They show that the regime has been highly successful in maintaining inflation close to target, strengthening the credibility of the sol (the Peruvian currency) and helping develop local currency markets. They also show that the switch from a monetary operational target (bank reserves) to a price target (the overnight interest rate) was instrumental in helping stabilize domestic currency interest rates, thereby improving the transmission capacity of monetary policy and helping develop a yield curve in local currency.

A somewhat related conclusion is reached in Chapter 5 by Leiderman, Maino and Parrado, who find that the switch to inflation targeting in Peru has lowered the pass-through of the exchange rate on prices (an outcome which seems to apply to all inflation targeters, as noted by Klaus Schmidt-Hebbel in his comments) while increasing the pass-through of the policy interest rate on banking rates. By inducing behavioural responses that accommodate policy changes, this intriguing result suggests that policy reform can be self-promoting.

Armas and Grippa also recognize, however, that high dollarization continues to affect the conduct of monetary policy. In particular, they underline that the monetary authorities remain concerned about the financial stress impact of large exchange rate fluctuations. These concerns are reflected in: (i) a broader use of exchange market interventions than would perhaps otherwise be the case; (ii) a high level of international reserves as a self-insurance mechanism against dollarization risks, as well as high reserve requirements on dollar liabilities of financial intermediaries; and (iii) the (transitory) recourse to changes in the interest rate to attenuate pressures on the exchange rate.

In this context, Leiderman, Maino and Parrado emphasize in Chapter 5 that further thinking is needed on how to adapt an inflation-targeting framework to incorporate more frequent interventions in the foreign exchange market and better explain to the public the policy constraints imposed by dollarization. Stronger reservations on the frequent use of exchange rate interventions in an inflation-targeting framework are expressed by Klaus Schmidt-Hebbel in his comments. In particular, Schmidt-Hebbel expresses concerns that such interventions may dilute the credibility of the inflation target and may be vulnerable to political pressures that would make them one-sided.

1.4 Prudential and crisis management

In their fascinating description of Uruguay's recent 'return from hell', Julio de Brun and Gerardo Licandro discuss in Chapter 7 the pitfalls of dollarization. They document the persistent liquidity crisis to which Uruguay was exposed in the wake of the Argentinian currency and banking crisis. While the Uruguayan banking system initially benefited from incoming deposits by Argentinians, the situation reversed and rapidly deteriorated as contagion effects settled in, dollar reserves dwindled and early International Monetary Fund (IMF) assistance proved insufficient to restore confidence. The floating of the exchange rate further amplified financial stress by undermining the debt-servicing capacity of dollar borrowers

with incomes in local currency. De Brun and Licandro also stress that the exchange rate devaluation greatly complicated fiscal and public debt management, as most of the public debt was dollarized and the banking system, a large part of which was public, benefited from implicit official guarantees. In turn, the worsening fiscal and public debt situation further contributed to undermine confidence. The crisis was only overcome when deposit convertibility was partially suspended. In particular, this implied that, when deposit liabilities could not be backed by the bank, the bank was liquidated, or, in the case of public banks, their non-transactional deposits were reprogrammed.

De Brun and Licandro draw a rich menu of lessons from the crisis, including the following: (i) exchange rate targeting and deposit guarantees promote dollarization by artificially limiting the risks of dollar financial instruments; (ii) by introducing a large variable and unpredictable component, the dollarization of public debt complicates both the measurement of the fiscal stance and the assessment of public debt sustainability; (iii) switching the exchange rate regime in the middle of a crisis can greatly complicate crisis management; and (iv) to make up for the limited lender of last resort capacity in dollars, dollar deposits should be subjected to high liquidity requirements.

In Chapter 8, Jorge Cayazzo, Antonio Garcia Pascual, Eva Gutierrez and Socorro Heysen conduct a comprehensive review of the prudential reforms that are needed to better internalize risks, limit the vulnerability of dollarized banking systems and open the way for a more flexible monetary policy. The authors base their conclusions on a review of Basel I and II guidelines, and a survey of current prudential practices in seventeen countries with wide-ranging levels of dollarization. They find that all countries have introduced regulations to deal with foreign exchange risk and most countries have implemented measures to reduce the vulnerabilities of financial systems to liquidity risk. However, only a small minority of countries has introduced specific regulations to deal with currency-induced credit risk and, among those which have, very few are highly dollarized. Moreover, these reforms are still for the most part very recent, have a limited scope, or have not yet been fully implemented. Thus, while the bad news is that there is still much to be done, the good news is that things are starting to move. Indeed, dollarized countries have become much more concerned about the perils of dollarization in the wake of the numerous recent banking crises in which dollarization played an important role.

Cayazzo, Garcia Pascual, Gutierrez and Heysen make a forceful case for a more proactive approach to internalizing dollarization risks. While the measures they propose are fully consistent with the spirit of Basel guidelines (particularly Basel II), they indicate that full implementation of Basel I standards would be insufficient to adequately address the specific vulnerabilities of highly dollarized economies. Thus, they propose that: (i) foreign exchange position limits be specifically adjusted to reflect the dollarization of banks' balance sheets; (ii) the supervision of currency-induced credit risk be strengthened through better information and disclosure, and more systematic stress testing based on parameters provided by the supervisor; (iii) the regulatory framework become currency specific, with

higher provisioning or capital requirements on foreign currency-denominated loans to non-foreign currency earning borrowers; and (iv) the use of liquidity requirements be generalized to limit the banking system's exposure to systemic liquidity risk.

In his comments, Turner further drives the point home that there is a critical need for prudential reform. He stresses that the Basel II framework should help in this endeavour. In particular, it should promote the development of a quantitative risk assessment culture that is fully grounded on statistical history. Turner also stresses the need for improving the market disclosure of dollarization-related risks. He also makes the interesting point that encouraging the entry of foreign banks into domestic markets should help limit dollarization and its risks by allowing foreign banks to lend internally in domestic currency rather than in foreign currencies from offshore.

Chapter 9, by Alain Ize, Miguel Kiguel and Eduardo Levy Yeyati, completes the discussion of prudential issues by discussing how to manage systemic liquidity crises of the type Argentina and Uruguay experienced. The authors make three basic points. First, while dollar liquidity buffers are expensive in countries where country risk premia are high (which is typically the case in highly dollarized countries), an external insurance that guarantees access to liquidity on an 'as-needed' basis is likely to be as expensive as self-insurance, once *adjusted for effective risk coverage*. Moreover, its availability in sufficient amounts is much less than certain. Indeed, the large insurance packages that have been put together recently for Mexico and Argentina turned out to be disappointing for the most part and not easily reproducible.

Second, providing dollar systemic liquidity through centralized reserves held at the central bank discourages banks from holding their own liquidity, subsidizes dollar intermediation and favours the more risky banks at the expense of the more conservative ones. Instead, it is optimal to impose liquid asset requirements (LARs) on dollar deposits.

Third, the adverse legal and fiscal implications from improvised attempts to stop systemic runs on deposits through forced deposit restructurings can be largely avoided with pre-wired circuit breakers (CBRs) that automatically suspend the convertibility of time deposits while ensuring continued access to sight deposits without breaking legal contracts. The authors conclude that CBRs, if presented in a non-threatening way and accompanied by adequate prudential policies (including LARs and an efficient bank resolution framework), can both narrow the scope for destabilizing runs on the banking system and limit the cost of bank runs once they occur.

1.5 The road to de-dollarization

Chapters 2 and 3 provide ample theoretical reasons why one may expect dollarization to be subject to considerable inertia and prone to hysteresis in already highly dollarized economies. Thus, reducing dollarization could be difficult, even if seemingly 'good' policies are being followed and price stability has been reached.

A first line of reasoning originates from the portfolio approach to dollarization. Under a constrained monetary regime, such as a pegged exchange rate, dollarization is a function of expected monetary management in the event of a collapse of the peg, no matter how improbable. Thus, depositors who expect inflation to erode local currency assets if the exchange rate is allowed to float will prefer to hold dollars. In turn, inflationary expectations are likely to translate into a high pass-through, feeding the monetary authorities' reluctance to let go of the exchange rate and preventing them from gaining credibility. Hence, while the authorities may have been able to make progress towards price stability, they cannot capitalize on it and dollarization remains high.

The credit risk and moral hazard paradigms provide similarly striking examples of dollarization hysteresis. In particular, when the economy is in the 'bad equilibrium' where the dollar dominates the MVP, improvements in monetary credibility will have no impact on currency choice as long as they do not translate into an effective flexibilization of the exchange rate regime.

The high dollarization inertia is corroborated in Chapter 4 by Rennhack and Nozaki, who, based on panel data and dynamic estimates, find considerable dollarization persistence. Thus, a 10 per cent improvement in the MVP leads to only a 0.3 per cent reduction in dollarization after one year. They find that persistence is particularly high in the Latin American region. The silver lining in their results, however, is that changes in relative volatilities, towards more stable prices and more volatile exchange rates, will eventually pay off. Indeed, they find that their model has significant out-of-sample predictive power.

The 'optimistic' view that dollarization should respond to good policies is shared by Cowan in his comments, where he stresses that dollarization has stabilized or declined in all but two countries in the Latin American region in the current decade. He also suggests that, due to identification problems, the response to credible radical policy changes may be much faster than appears to be implied in Rennhack and Nozaki's estimates.

That good monetary management pays off in terms of de-dollarization and local currency market development is indeed one of the key messages in the description of the Peruvian experience by Armas and Grippa in Chapter 6 and Renzo Rossini in Chapter 13. Dollarization in Peru has declined significantly over the last few years and local currency markets, including for medium-term nominal bonds markets, have grown quite rapidly under the current inflation-targeting regime.

Additional supporting evidence in favour of good policies is given in Chapter 11 by Hardy and Pazarbasioglu who cite the successful gradual de-dollarization experiences of Israel, Mexico and Poland, all of which have substantially de-dollarized (although their dollarization levels never reached those of Peru or Bolivia) after (or in the context of) adopting inflation-targeting frameworks. They also make an important related point that financial liberalization can help de-dollarize those countries where local currency markets have been repressed. The cases of Egypt and Pakistan provide telling illustrations.

The fact that good policies appear to work but may require a long time to make a real difference raises key strategic questions. Should all dollarized countries

follow the same route and benefit from de-dollarization as a side effect of a shift to inflation targeting or should they follow alternative routes?

A seemingly compelling case is made in Chapter 10 by Allison Holland and Christian Mulder for promoting price-indexed public debt instruments in order to limit the cost and risk of public debt, and encourage the growth of 'dollar financial substitutes'. Holland and Mulder make the important point that price-indexed instruments should not be viewed as imperfect substitutes for fixed-price instruments, only to be used by those countries that are unable to make quick progress in enhancing the credibility of their currencies. Indeed, they show that price-indexed instruments have clearly become 'mainstream' in most industrial countries. While they recognize that the liquidity of price-indexed instruments is often more limited than that of fixed-price instruments where the two coexist at similar maturities, they stress that price indexation may be the only affordable way to rapidly extend the maturity of local currency instruments in highly dollarized countries. They also emphasize that, compared to fixed-price instruments, price-indexed instruments reduce the public debt cost of disinflation and limit the scope for inflating away the public debt. Thus, their introduction should enhance (rather than undermine) the credibility of monetary policy.

Ize makes a somewhat related point in Chapter 2. By limiting the vulnerability of the financial sector to exchange rate fluctuations, a shift from dollar instruments to price-indexed instruments can facilitate the flexibilization of the exchange rate regime, which, in turn, is a precondition to bolster demand for fixed-price local currency instruments. Price indexation can thus be viewed as a 'bridge' towards the development of local currency fixed-price markets, much as in the recent Chilean experience with the use of the 'unidad de fomento (UF)' as a bridge towards the local currency.

However, in his comments on Part IV, Augusto de la Torre stresses that the success of price indexation in financial contracts is likely to be 'path dependent'. Thus, the fact that price indexation was successful to prevent dollarization in Chile offers little guarantee that it would also be useful in reversing dollarization in countries where dollarization is already entranched. When dollar markets are already blooming, price indexation may no longer be that attractive to market participants. Similar reservations are expressed in Luis Oscar Herrera's comments, based on the Chilean experience. He stresses that the promotion of the UF in Chile was part of a comprehensive and very persistent strategy of 'fully fledged indexation', which may be hard to replicate. Herrera also warns about the potentially adverse impact of indexation on inflationary inertia (a concern echoed by Leonardo Leiderman in Chapter 13) and the difficulties indexation may bring at a later stage when the local and international financial markets need to be integrated (a somewhat related comment is made by Morales, who suggests that dollarization is the best route to integrate with international markets). Hence, Herrera's view is that countries that have already achieved price stability should head straight to 'nominalization' (develop fixed-price local currency instruments).

While also expressing some reservations about the potential illiquidity of price-indexed instruments, Claudio Irigoyen, in his comments, takes a more

middle-of-the-road view. He disagrees with the view that indexation, per se, fosters inflationary inertia. Instead, he justifies the need to issue price-indexed debt as part of a comprehensive, portfolio-based strategy that applies even to environments with full monetary policy credibility.

Chapter 11, by Hardy and Pazarbasioglu, presents the opposite extreme case of one-stop de-dollarizations through forced conversions. While they rightly emphasize that forced de-dollarizations might not be politically appealing during tranquil times, the case in their favour appears to be stronger than usually recognized, both on theoretical grounds and on empirical grounds. As underlined in Chapters 2 and 3 and by Jeanne in his comments, a forced conversion might provide the only effective way to ensure the necessary coordination for a successful and speedy exit from a high, bad dollarization equilibrium to a good, low dollarization equilibrium. Indeed, Hardy and Pazarbasioglu show that Pakistan's forced conversion was seemingly successful and sustained. While caution is needed in the case of Argentina, where the jury is still out as regards the longer-term impact of the forced conversion, the experience thus far appears to be evolving rather positively.

The seemingly successful experiences in Pakistan and Argentina stand in sharp contrast with the unsuccessful experiences of Bolivia and Peru in the 1980s. Hardy and Pazarbasioglu justify the different outcomes mainly on the basis of radically different post-conversion macroeconomic policies. They also stress that policies that limit the dollarization of loan contracts, as was the case in Pakistan, are both likely to limit the scope for dollarization and facilitate a forced conversion if it becomes needed.

1.6 What lies ahead?

The main message in this volume is that it is time to take a more proactive approach towards dealing with financial dollarization and its risks. While not perfect, our understanding of the dollarization phenomenon has improved greatly. Moreover, early experiences in policy reform are sufficiently encouraging to warrant the formulation of a comprehensive policy agenda.

As noted by Agustín Carstens, Juan Antonio Morales, Francisco de Paula Gutierrez and Markus Rodlauer in Chapter 13, fiscal consolidation is a clear prerequisite for any realistic de-dollarization strategy. Without it, there is little hope for a strong and independent monetary policy. However, once the fiscal foundation is in place, a regime shift towards exchange rate flexibility and inflation targeting is feasible even in highly dollarized countries and should provide, albeit with some lag, the first incentives to de-dollarize. Foreign exchange market intervention cannot be ruled out at this stage, and should be disclosed and explained in a way that the market can understand and predict (as stressed by Leiderman and Rossini in Chapter 13), although interventions may ultimately need to be phased out (Schmidt-Hebbel).

This does not necessarily mean, however, that all countries should immediately adopt a fully fledged inflation target. As emphasized by Ize and Levy Yeyati in Chapter 3, some countries may not meet the necessary structural or institutional

requirements to support such a radical policy switch, and the choice of an exchange rate regime may respond to other objectives than de-dollarization. Nor does this mean that countries should be constrained to choose between exchange rate flexibility and low inflation, on the one hand, and full dollarization, on the other. Indeed, it may be preferable to maintain a dual currency system, even when financial dollarization is very high, if this enhances the flexibility of the real exchange rate (as Leiderman, Maino and Parrado argue is the case in Bolivia).

As regards prudential policy, the key message is that more needs and should be done irrespective of the monetary authorities' intentions and the reasons for dollarization. In particular, the liquidity and solvency risks to which highly dollarized banking systems are exposed need to be better internalized. Although this should help level the playing field for the local currency, the main rationale objective for prudential reform is not de-dollarization per se. Instead, it is to limit the vulnerability of banking systems in a way that is consistent with market efficiency and the prevailing monetary regime. In this sense, the currency exposure associated with dollarization should be treated as any other source of banking fragility, and addressed accordingly. As underlined in Chapter 8, however, prudential reform is likely to be a much tougher sell in already highly dollarized economies: tightening prudential norms on dollar contracts could induce some disintermediation – not a bad outcome in itself if it reflects a more accurate pricing of risk – or, as stressed by de la Torre, a shift into alternative but equally risky forms of intermediation.

In meeting these challenges head on, the supervisory authorities will require both the necessary skills and the political support (and, as Julio de Brun notes in his comments, autonomy from the monetary authority) to avoid mixing up the policy signals when setting the parameters to evaluate banks' exposure to currency-induced credit risk.

Monetary and prudential reforms clearly need to be complemented by policies to help promote the development of local currency markets, the third main leg of the policy agenda. In particular, good public debt management and the development of a Treasury bond market in domestic currency make it possible to build a yield curve that can be used as a benchmark for private sector issuances. Whether this is based on consumer price index(CPI)-indexed or nominal bonds will depend on the credibility of the domestic currency, in particular the long-run inflation expectation premium. A combination of a nominal short end and an indexed long end is likely to be the preferable outcome in many cases. As emphasized by de la Torre and de Paula Gutierrez, investors' interest for price-indexed instruments is more likely to materialize in the case of longer-term instruments, such as mortgages, that offer pension funds and annuity providers the hedge they need against their long-term CPI-indexed liabilities.

Finally, the linkages between payments dollarization, real dollarization (i.e., the dollarization of wage and price contracts) and financial dollarization are also important in devising a comprehensive strategy towards de-dollarization. As noted by Morales and Rossini in Chapter 13, throwing some 'sand in the wheels' and limiting, through legal or regulatory reform, the scope for using the dollar as a means of payment and a unit of account – that is, reversing the policies

implemented in the past to facilitate dollarization in the belief that they promote financial deepening at little cost – should broaden the use of the local currency and ultimately also contribute to financial de-dollarization.

In sum, while good macroeconomic policies are a crucial prerequisite, recent experience shows us that they may not be sufficient. To undo widespread and entrenched dollarization, a comprehensive policy strategy that includes strong micro and market-oriented components is also likely to be needed.

Part I

Financial Dollarization: Roots and Dynamics

2

Financial Dollarization Equilibria: A Framework for Policy Analysis

Alain Ize[1]

2.1 Introduction

The continuing upward trend in de facto dollarization in most regions of the world and the wave of recent corporate and banking crises in Asia and Latin America, where dollarization played an important supporting role, have raised policy-makers' consciousness about the need for policy action. Perceptions of de facto financial dollarization (FD) as a mostly unavoidable phenomenon, generally benign and often beneficial to monetary stability and financial development in countries with limited currency credibility, have given way to more sobering thoughts.[2] With the growing realization of the risks that dollarization imposes on the financial system, policy-makers' attention has shifted towards finding ways to reverse dollarization or at least limit its drawbacks.

This chapter aims at providing a unified framework for policy analysis, based on a good grasp of the roots of dollarization and its interplay with monetary and prudential policies. The chapter both extends and streamlines a paper by Ize and Powell (2004) that covered basic analytical issues less thoroughly but addressed policy issues in greater length, particularly on the prudential side.

The chapter starts from the premise that FD is a home-grown phenomenon resulting from a credit market equilibrium between creditors and borrowers who both optimize on the currency composition of loan contracts. The focus of analysis differs in this sense from that followed in the 'original sin' and 'liability dollarization' literature, which does not model currency choice as a market equilibrium or, when it does, stresses equilibria between domestic borrowers and *foreign lenders*. Instead, this chapter brings together the more limited (but growing) literature that looks at asset and liability dollarization as a simultaneous and interactive phenomenon.[3]

In addition to providing a systematic and uniform analysis of the existence, stability and multiplicity of dollarization equilibria under different paradigms and institutional and market environments, the chapter makes a few novel contributions. In particular, it provides a finer analysis of the underpinnings of monetary

policy endogeneity and the peso premium, both key underlying determinants of dollarization. It distinguishes four interrelated yet distinct features of monetary policy: (i) credibility; (ii) fear of floating; (iii) overvaluation overhang; and (iv) asymmetry. All four affect dollarization, but in different ways and through different channels. Thus, a sound understanding of their respective roles is important in shaping up policy reform.

Section 2.2 presents the basic framework of analysis. Section 2.3 applies this framework to the case with risk aversion but no defaults. Section 2.4 explores the opposite case with defaults but no risk aversion. Section 2.5 extends the framework to the case of imperfect information and moral hazard. Based on these alternative paradigms, Section 2.6 examines which policy changes might help de-dollarization. Section 2.7 concludes.

2.2 The model

The economy

The economy consists of: (i) a government (that includes a monetary authority and a prudential authority); (ii) investors (who may be risk averse and invest in a mix of fully guaranteed pesos and dollar deposits); (iii) risk-neutral corporates (which borrow in a mix of pesos and dollars to finance projects); and (iv) risk-neutral banks (which intermediate between corporates and investors while taking themselves a neutral currency position). I define λ_i as the dollar share in the portfolio of the marginal lender or marginal borrower and λ as the dollar share in the economy as a whole. An 'equilibrium' currency composition is obtained when all agents transact with the same currency composition ($\lambda_i = \lambda$, for all i's) and monetary policy is consistent with that level of dollarization. The equilibrium is stable if individual borrowers have no incentive to deviate from the currency choices made by other agents.

The economy is subjected to random real or capital account disturbances that affect the equilibrium real exchange rate and may result in overvaluations or undervaluations. Reflecting asymmetric price rigidities, undervaluations are immediately resolved through price increases while overvaluations must be resolved through nominal depreciations. Yet, such overvaluations may linger on due to a reticence (explained below) by the monetary authority in devaluing the exchange rate. Thus, exchange rate overvaluations tend to build up over time until they are eventually undone through a large nominal depreciation.

I will thus assume that: (i) the equilibrium real exchange rate is zero; (ii) there is a current overvaluation overhang $\hat{\delta}$; (iii) next period's real exchange rate may become further overvalued so that the real equilibrium exchange rate, δ^*, is uniformly distributed over the range $[\hat{\delta},\hat{\delta} + \hat{\delta}]$;[4] and (iv) there is a threshold exchange rate overvaluation, $\bar{\delta}$, for which the authorities allow the exchange rate to float so as to eliminate the overvaluation. Hence, if δ is next period's real devaluation, when $\delta^* > \bar{\delta}, \delta = \delta^*$ and the real overvaluation is eliminated; instead, when $\delta^* < \bar{\delta}, \delta = 0$ and the real overvaluation becomes δ^*.

Borrowers invest in a project whose real return next period, ρ, is expected to fall below its equilibrium level, $\hat{\delta}$, if the real exchange rate becomes overvalued, and will rise back to its equilibrium level if the exchange rate is allowed to float:[5]

$$\rho = \hat{\delta} - \mu(\delta^* - \delta), \mu \in [0,1] \tag{1}$$

Reflecting the maturity of financial transactions, financial contracts are settled before agents observe the shock. Borrowers default when the real cost of debt servicing, taking into account the equilibrium and actual exchange rate, exceeds the return on the project. In the case of default, banks receive ρ minus a liquidation cost, ω.[6] Thus, by increasing project returns, devaluations are expected to be expansionary (in relation to today's equilibrium) as long as there is an overhang ($\hat{\delta} > 0$). However, they become contractionary (*relative to the initial equilibrium*) when the liquidation costs associated with bankruptcies more than offset the direct output gains of the devaluation (this will be the case when $\varpi > \mu\hat{\delta}$).[7]

Monetary policy

Monetary policy is set after the shock is observed and there is no possibility to precommit. Based on the realized shock and the welfare implications of a devaluation, the monetary authorities must decide whether to continue pegging the exchange rate at its current level or to let it depreciate so as to match the equilibrium real exchange rate. The choice of the devaluation threshold, $\bar{\delta}$, is based on comparing the welfare impacts of not devaluing versus devaluing. The former includes the loss of output caused by overvaluations and the possible associated financial stress resulting from a depressed economic activity. The latter reflects the authorities' concerns about the financial stress induced by a devaluation, or the inflationary implications of the devaluation when monetary policy lacks credibility.[8]

The higher the monetary credibility gap, the higher the expected inflation pass-through of a devaluation, ν, and, hence the higher the penalty associated with a devaluation. I thus assume that the credibility cost of devaluing is proportional to the pass-through: $a\nu$, $a > 0$. As for financial stress, I assume it is proportional to the cost of liquidations. Thus, a factor $b\varpi$ ($b > 0$) also enters into the welfare function whenever there is a default.

For simplicity, I will only consider the two polar cases where: (i) monetary stability concerns fully outweigh financial stability concerns (b is small; a/b is large); or (ii) financial stability concerns fully dominate monetary stability concerns (b is large; a/b is small). In the first case, the devaluation threshold is exogenous to dollarization and devaluations occur for:

$$\delta^* > \bar{\delta}_\nu = \frac{a\nu}{\mu} \tag{2}$$

In the second case, the devaluation threshold becomes a function of dollarization and there are three possibilities:

- when not devaluing triggers a default, the authorities will devalue as soon as needed to prevent a default;

- when devaluing triggers a default, the authorities will resist devaluation as much as possible to prevent a default; and
- when a default takes place whether the exchange rate is devalued or not, financial stress concerns cancel out and the government will devalue for $\delta^{\star} > \bar{\delta}_{v}$.

Financial equilibrium

Investors trade off risk and returns over their total income $Y = \bar{Y} + r^{d}(\lambda_i)$, where $r^{d}(\lambda_i)$ is the real return on a deposit with a currency mix λ_i and $\bar{Y}$ is non-financial income (which does not depend on λ_i). Thus, they choose the currency mix that maximizes a utility function of the following type:

$$Max\left[E\{r^{d}\} - \frac{c}{2}Var\{Y\}\right] \tag{3}$$

Defining ND^{j}, D^{j}, $j = B,C$ as the no-default and default outcomes for banks and corporates, respectively, $r_l(\lambda_i)$ as the real borrowing rate, and k as banks' capital, banks' maximization problem may be similarly written:

$$Max[E\{(r^{l}-r^{d})/ND^{C}\} + E\{(\rho-\varpi-r^{d})/D^{C},ND^{B}\}-E\{k/D^{B}\}] \tag{4}$$

Finally, corporates' maximization problem is such that:

$$Max[E\{(\rho-r^{l})/ND^{C}\}] \tag{5}$$

Summing up the three expressions above and noting that banks can only default if corporates do, so that $E\{\rho,r^{d}\} = E\{\rho,r^{d}/ND^{C}\} + E\{\rho,r^{d}/D^{C},ND^{B}\} + E\{\rho,r^{d}/D^{B}\}$ and $E\{\varpi/D^{C}\} = E\{\varpi/D^{C},ND^{B}\} + E\{\varpi/D^{B}\}$, leads to:

$$Max[E\{\rho\}-E\{\varpi/D^{C}\}-E\{(\rho+k-\varpi-r^{d})/D^{B}\}-\frac{c}{2}Var\{Y\}] \tag{6}$$

Since $E\{\rho\}$ is independent of λ_i, maximizing this last expression is equivalent to:

$$Min[\frac{c}{2}Var\{Y\}+E\{\varpi/D^{C}\}+E\{(\rho+k-\varpi-r^{d})/D^{B}\}] \tag{7}$$

The first term in this expression is a volatility term. In the presence of risk aversion ($c > 0$) the preferred currency is that which better smoothes out investors' income. The second term is a credit risk term. In the presence of default risk, the preferred currency is that which minimizes expected default costs. The third term is a moral hazard term and corresponds to the option value of defaulting. In the presence of deposit guarantees, the preferred currency is that which maximizes available net subsidies as derived from the net payments by the deposit guarantor in the event of bank default (the deposit rate, including valuation gains, minus the recovery value of the loans).[9]

Thus, the equilibrium currency mix is derived from a combination of three motives, income smoothing, credit risk minimization and moral hazard, with

weights that are a function of the relative sizes of the three parameters c, ϖ and k. I will now explore each of these paradigms one at a time.

2.3 The volatility paradigm

If project returns are high enough to eliminate credit risk, neither corporates nor banks can become bankrupt and only the first term in (7) remains. Expressing real interest rates as $r = R + \lambda_i S - P$ where R is the nominal interest rate, S the nominal exchange rate and P the price level, (7) may be expressed as:

$$Min\left[\lambda_i^2 Var\{S\} - 2\lambda_i(Cov\{S,P\} - Cov\{S,\overline{Y}\}) + Var\{\overline{Y} + R^d\} + Var\{P\} - Cov\{P,\overline{Y}\}\right] \tag{8}$$

Differentiating with respect to λ_i:

$$\lambda_i = \frac{Cov\{S,P\}}{Var\{S\}} - \frac{Cov\{S,\overline{Y}\}}{Var\{S\}} \tag{9}$$

The first term in the expression above minimizes the volatility of real returns and can be defined as the MVP term. The dollar is preferred to the peso if the nominal exchange rate covaries with the price level (i.e., if the pass-through is high) and/or the nominal exchange rate is stable.[10]

Figure 2.1 illustrates in the context of a pegged regime. Peso rates are higher than dollar rates in the absence of a devaluation. With a devaluation, the opposite

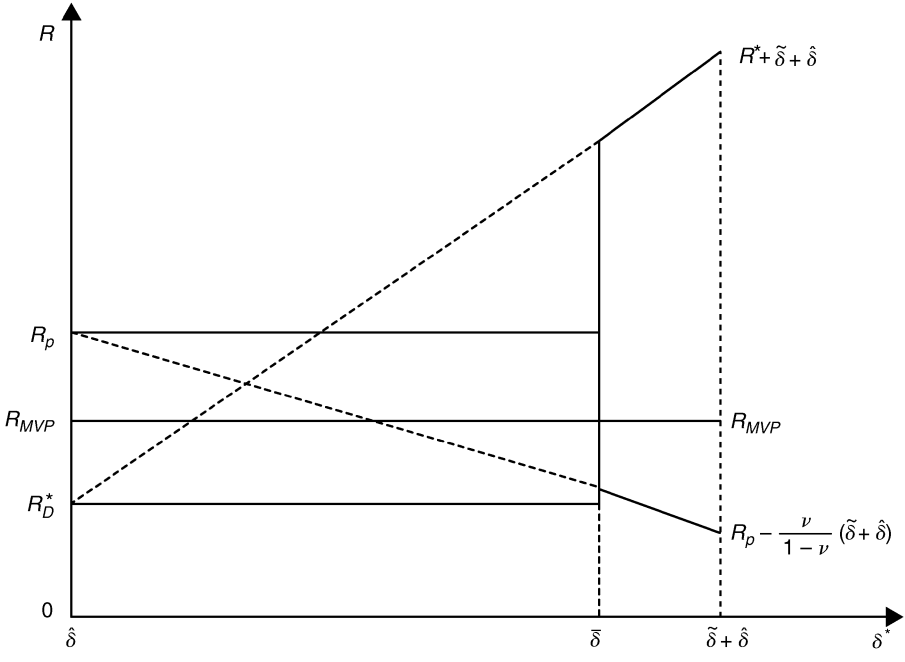

Figure 2.1 Interest rates without credit risk

holds true. While both the peso and the dollar have uncertain returns, depositors can perfectly hedge their financial income by choosing the mixed currency MVP portfolio, $\lambda_i = \nu$, such that the gains on dollar assets in the event of a depreciation are exactly offset by the losses on peso assets.

I will thus refer to 'MVPs' as a composite currency that protects investors from devaluation-induced inflationary losses.[11] Notice that the higher the expected pass-through, the more uncertain peso returns become. The MVP can thus be viewed as *a perfectly credible peso surrogate*. Notice also that dollarization does not depend on the probability of a regime change (i.e., on $\bar{\delta}$). Instead, it only depends on the expected monetary policy following a collapse of the exchange rate, *no matter how improbable this collapse*.

The second term in (9) can be defined as a 'safe haven' effect. When non-financial income and financial income are correlated, investors prefer a mix whose returns are higher when their real income is lower. In particular, should real income be negatively correlated with the exchange rate (devaluations coincide with output contractions), this would further promote the use of the dollar (in excess of MVP). However, in the absence of default, net project returns (hence output) *rise with depreciations*. Even if they do not own the firms, depositors' real income is thus more likely to rise than to fall. In the absence of credit risk, the safe haven effect is therefore more likely to promote the peso than the dollar.

2.4 The perfect information credit risk paradigm

The nature of the equilibrium

Suppose now that depositors are risk neutral and corporates are exposed to default. However, banks have sufficient capital to ensure that they never default. Thus, provided $\varpi > 0$, currency choice is entirely driven by the second term in (7). Furthermore, with perfect information, creditors can always observe the currency mix in which other creditors are lending to any given debtor. This rules out strategic behaviour among creditors and ensures that all lend in the same optimal mix. Liquidation costs should therefore be evenly shared between all creditors, making ϖ independent of λ_i. Thus, (7) further reduces to choosing the currency composition that minimizes the probability of corporate default, $E\{D^C\}$.

The risk premium

Define $R^*(\lambda_i, \bar{\delta})$ as the credit risk-free nominal interest rate faced by a *marginal* depositor in an economy with a monetary rule $\bar{\delta}$. Interest rate parity should hold and ensure that the real credit risk-free ex ante rate, r^*, is the same for any lending mix. Assuming perfect capital mobility and assuming away country risk, it should also ensure that the nominal credit risk-free dollar interest rate equals the US dollar rate, R^*_D. Finally, for any lending mix, it should equalize the real ex ante credit risk-free rate to the nominal rate, adjusted for expected valuation gains and losses due to inflation and depreciation:

$$r^* = R^*(\lambda_i, \bar{\delta}) - \frac{1}{\bar{\delta}}\left[\int_{\bar{\delta}}^{\bar{\delta}+\bar{\delta}}\left[(1-\lambda_i)\,\frac{\nu}{1-\nu} - \lambda_i\right]\delta^* d\delta^*\right] \tag{10}$$

From which:

$$R^*(\lambda_i, \bar{\delta}) = r^* + \frac{\nu - \lambda_i}{1 - \nu}\Delta \tag{11}$$

where Δ is the expected depreciation:

$$\Delta = \frac{1}{\bar{\delta}}\int_{\bar{\delta}}^{\bar{\delta}+\bar{\delta}} \delta^* d\delta^*. \tag{12}$$

It follows that:

$$R_D^* = R^*(1,\bar{\delta}) = r^* - \Delta \tag{13}$$

$$R_P^* = R^*(0,\bar{\delta}) = r^* + \frac{\nu}{1 - \nu}\Delta \tag{14}$$

$$R_{MVP}^* = R^*(\nu,\bar{\delta}) = r^* \tag{15}$$

Thus, the dollar earns a negative premium, reflecting valuation gains in the event of a nominal depreciation but no valuation losses in the event of symmetric nominal appreciation. Indeed, monetary policy is *asymmetric* in that it may correct for overvaluations through nominal devaluations but never corrects for undervaluations through nominal appreciations. This ends up rewarding the dollar, which becomes a *one-sided bet* (*its value, compared to the peso, can only go up, but not down*). As we will now see, this is a key underlying determinant of high dollarization.

The peso, on the other hand, earns a positive premium, reflecting valuation losses from inflationary erosion under a depreciation. The less *credible* monetary policy is (the higher ν), the higher the peso's nominal cost, reflecting its higher exposure to inflationary losses. Thus, the more handicapped it becomes vis-à-vis the dollar.

While the MVP is not affected by the credibility premium, it does not benefit from valuation gains and is thus 'more expensive' than the dollar. Notice also that, since prices rise by a factor ν after a depreciation, the MVP can be viewed as the currency in which prices are 'denominated', hence the one that *minimizes mismatches in borrowers' balance sheets*.

Default thresholds

Let $R(\lambda_i, \bar{\delta})$ be the nominal interest rate that incorporates credit risk, i.e., the loan return expected by a bank. The nominal rate should rise to incorporate expected loan losses, which are a function of monetary policy, the currency mix and the profile of project returns, all of which are endogenous. A default can occur due either to a devaluation that triggers valuation losses on a highly dollarized loan (i.e., due to *currency risk*) or from an overvaluation (i.e., the absence of a devaluation) that depresses the return on the project below the interest rate on the loan. In this latter case, the default occurs due to a combination of *output-induced credit risk* and *interest rate-induced credit risk*.

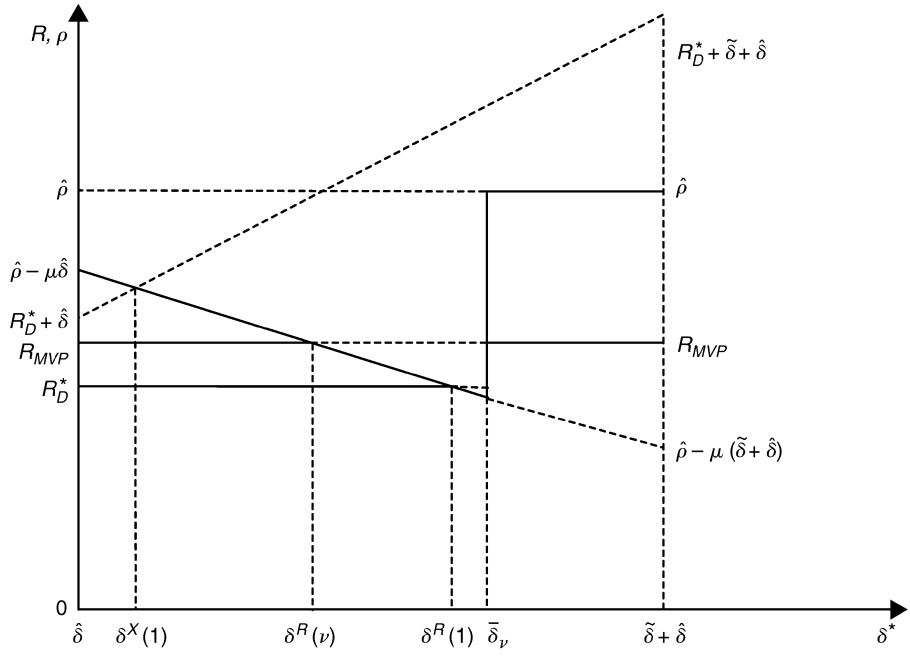

Figure 2.2 Interest rates with credit risk

A simple graphic analysis helps situate the problem (Figure 2.2). In the event of a devaluation-induced default, the return on a dollar loan, $\hat{\rho}$, is below the risk-free dollar return but *above the return in the absence of a devaluation*, R_D. Instead, because it does not benefit from such a windfall, the MVP rate must compensate by offering a higher return than the dollar rate under no devaluation. An MVP loan is therefore not exposed to currency risk but more 'expensive', hence more exposed to interest rate-output risk in the event of no devaluation. The more sensitive project returns are to overvaluations (the higher μ), the more scope for interest rate-output risk as project returns dip deeper below the equilibrium return. An increase in $\bar{\delta}$ has a similar effect; fear of floating (i.e., delaying needed exchange rate adjustments) reduces the scope for currency risk but increases the scope for interest rate risk. The peso is further exposed than the MVP to interest rate risk, due to the fact that its value is eroded by inflation in the event of a depreciation (hence, its nominal interest rate is higher).

Proceeding now to a formal analysis, define $\delta^X(\lambda_i, \bar{\delta})$ and $\delta^R(\lambda_i, \bar{\delta})$ as the exchange rate thresholds that trigger currency-induced and interest rate-induced corporate bankruptcies, respectively. Consider first the case of mixes such that $\delta^R(\lambda_i, \bar{\delta}) > \bar{\delta}$. Since a devaluation occurs before the interest rate default threshold is reached, these mixes are only exposed to currency risk, but not to interest rate risk. For the

marginal borrower, δ^X is such that the ex post real interest rate equals the rate of return on the project:

$$R - \frac{\nu}{1-\nu}(1-\lambda_i)\delta^X + \lambda_i\delta^X = \hat{\rho} \tag{16}$$

Or:

$$\delta^X = \frac{1-\nu}{\lambda_i - \nu}[\hat{\rho} - R], \tag{17}$$

where, assuming $\hat{\rho} < R + \bar{\delta}$ (the devaluation threshold is high enough to trigger a default under full dollarization), R is such that:

$$\frac{1}{\tilde{\delta}}\left[\int_{\hat{\delta}}^{\bar{\delta}} R d\delta^* + \int_{\bar{\delta}}^{\hat{\delta}+\tilde{\delta}} (\hat{\rho} - \varpi) d\delta^*\right] = r^* \tag{18}$$

Solving (18), using (17), leads to:

$$\frac{\delta^X}{\tilde{\delta}} = \frac{1-\nu}{\lambda_i - \nu}\frac{1}{\bar{\delta} - \hat{\delta}}\left(d - \frac{\tilde{\delta} - \bar{\delta}}{\hat{\delta}}\varpi\right), \tag{19}$$

where $d = \hat{\rho} - \varpi - r^*$ is the equilibrium distance to default, inclusive of liquidation costs, which I assume to be positive. Holding $\bar{\delta}$ constant (i.e., *for a given monetary policy*), the δ^X schedule has the hyperbolic shape with respect to λ_i shown in Figure 2.3. Currency-induced credit risk, $\tilde{\delta} + \hat{\delta} - \delta^X$, rises with dollarization and vanishes below MVP.[12]

Take now the case of mixes $\lambda_i \leq \nu$, that are only exposed to interest/output rate risk. The exchange rate shock δ^R that triggers a default when the exchange rate is not devalued is such that:

$$\delta^R = \frac{\hat{\rho} - R}{\mu}, \tag{20}$$

where R is given by:

$$\frac{1}{\tilde{\delta}}\left[\int_{\hat{\delta}}^{\delta^R} R d\delta^* + \int_{\delta^R}^{\bar{\delta}} (\hat{\rho} - \mu\delta^* - \varpi) d\delta^* + \int_{\bar{\delta}}^{\hat{\delta}+\tilde{\delta}} \left(R + \frac{\lambda_i - \nu}{1-\nu}\delta^*\right) d\delta^*\right] = r^* \tag{21}$$

Solving (21) using (20) leads to:

$$(\delta^R/\tilde{\delta} - \bar{\delta}/\tilde{\delta})^2 + 2\delta^R/\tilde{\delta} + 2(\varpi/\mu\tilde{\delta})(1 + \delta^R/\tilde{\delta} - \bar{\delta}/\tilde{\delta}) = \frac{2}{\mu\tilde{\delta}}\left(d + \frac{\lambda_i - \nu}{1-\nu}\Delta\right) \tag{22}$$

It can be easily checked that $\frac{d\delta^R}{d\lambda_i} > 0$ for μ, $\Delta > 0$. Hence, the δ^R schedule is positively sloped (interest rate risk rises as λ_i declines) if there is a positive probability of an exchange rate collapse and project returns are exchange rate sensitive.

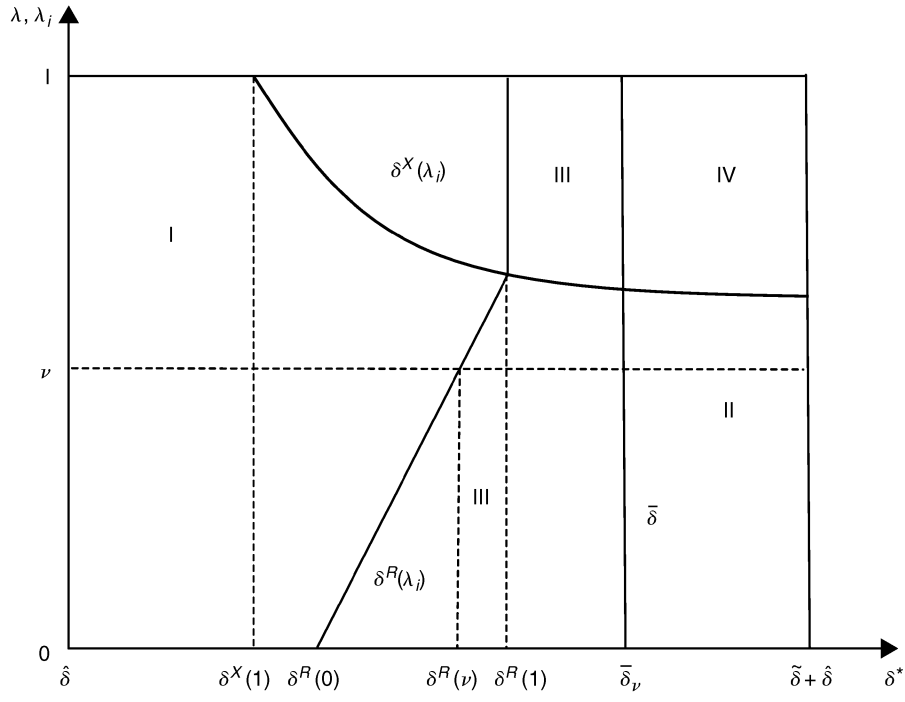

Figure 2.3 The dollarization risk map with an exogenous monetary policy

Consider finally the case of mixes exposed to both currency risk and interest rate risk, which are in the high dollarization region ($\lambda_i \in [\lambda^X, 1]$, see Figure 2.2) and such that $\delta^R(\lambda_i, \bar{\delta}) < \bar{\delta}$:

$$\frac{1}{\tilde{\delta}}\left[\int_{\hat{\delta}}^{\delta^R} R d\delta^* + \int_{\delta^R}^{\bar{\delta}} (\hat{\rho} - \mu\delta^* - \varpi) d\delta^* + \int_{\bar{\delta}}^{\hat{\delta}+\tilde{\delta}} (\hat{\rho} - \varpi) d\delta^*\right] = r^* \tag{23}$$

Solving (23) leads to:

$$(\delta^R/\tilde{\delta} - \hat{\delta}/\tilde{\delta})^2 + (\bar{\delta}/\tilde{\delta})^2 - (\hat{\delta}/\tilde{\delta})^2 - 2(\varpi/\mu\tilde{\delta})(\delta^R/\tilde{\delta} - \hat{\delta}/\tilde{\delta}) = \frac{2d}{\mu\tilde{\delta}} \tag{24}$$

Returns are the same for any mix in that range (R is independent of λ_i); hence any mix is similarly priced and the δ^R schedule is vertical.

The case of an exogenous monetary policy

A dollarization risk map can now be drawn as a function of the default thresholds, monetary policy and aggregate dollarization. Consider first the simpler case in which the monetary authority is not concerned about the financial stress implications of monetary policy ($b = 0$). In this case, the $\bar{\delta}$ schedule is a vertical line that

divides the risk map into four regions (Figure 2.3). In Region I, where shocks are moderate, nothing happens. In Region II, shocks are large and there are currency crises (the exchange rate is devalued). Yet, the financial system remains resilient because the currency mix is not too different from MVP (there is only *a moderate currency mismatch*). In Region III, shocks are not sufficiently large to trigger a devaluation, yet failure to devalue triggers an interest rate risk-induced debt crisis. Finally, in Region IV, shocks are large enough to trigger a devaluation and the economy sufficiently dollarized to cause currency risk-induced corporate bankruptcies. As a result, there is a twin currency-financial crisis.

A high dollarization mix will be preferred to a low dollarization mix if the currency risk of the former is lower than the interest rate/output risk of the latter. As the following proposition shows, there is a wide range of parameter values for which this will become the case (the dollar will dominate) as monetary credibility declines.

Proposition 1. *When credibility concerns dominate and credibility is high, highly pesified equilibria are locally weakly stable (the economy could stay there but could also drift towards higher dollarization); as credibility declines, contracts dollarize, migrating towards an equilibrium with a dollar share slightly above MVP; as credibility declines further, the economy stays in the MVP region if there is no overvaluation overhang or project returns do not increase with a devaluation; however, if there is a sufficient overhang and a positive probability of an exchange rate collapse* ($\hat{\delta} > (\tilde{\delta} + \hat{\delta} - \bar{\delta})/2 > 0$), *moderate liquidation costs and project returns increase with a devaluation* ($\mu > 0$), *there exists a positive range of equilibrium distances to default such that the economy eventually jumps to a highly dollarized equilibrium.*

Proof. *See Appendix 2.1*

The existence of an overvaluation overhang, combined with the fact that overvaluations are contractionary, makes the profile of project returns closer to that of the dollar, as illustrated by Figure 2.2. The higher return obtained on dollar loans in the event of a devaluation reduces their required return in the absence of a devaluation. Thus, project and dollar returns are both low in the absence of a devaluation, high with a devaluation, enhancing the attractiveness of the dollar by making dollar contracts closer substitutes for output-based contingent contracts.[13]

As in the case of macro-dollarization, highly dollarized equilibria can dominate peso equilibria if there is a positive probability of collapse, no matter how small. This result is even more remarkable here in that fear of floating can in fact *broaden* the range of parameter values for which a fully dollarized equilibrium exists. Indeed, as the probability of collapse vanishes, so does the need for an overvaluation overhang ($\hat{\delta} \to 0$ as $\bar{\delta} \to \tilde{\delta}+\hat{\delta}$).[14]

Less exchange rate flexibility also enhances the scope for overall contractionary devaluations (such that $\varpi > \mu\hat{\delta}$). Indeed, in the limit case of a highly dollarized equilibrium with extreme fear of floating and a vanishing overvaluation overhang, positive liquidation costs, even if very small, ensure that devaluations are contractionary.

In turn, the fact that devaluations are contractionary may now induce a negative correlation between investors' real incomes and the exchange rate. Thus, in an already highly dollarized environment with fragile balance sheets and risk aversion, *the safe haven effect could further promote the use of the dollar.*

Finally, notice that since $\delta^R(\nu) > \delta^R(0)$, the range of parameter values for which the dollar is preferred to the peso is broader than that for which the dollar is preferred to the MVP. The relative peso's attractiveness is undermined by its low credibility, which raises its nominal cost and increases the interest rate risk of peso contracts.[15]

The case of an endogenous monetary policy

Consider next the case in which financial stability concerns dominate (b is large), so that the central bank fits its monetary policy to minimize the probability of financial crises. The devaluation trigger (and the default schedules) then becomes a function of aggregate dollarization, $\bar{\delta}(\lambda)$. Should all loans be denominated in MVPs (or pesos), the central bank would adopt a flexible exchange rate policy and devalue for all shocks that would trigger corporate defaults in the absence of devaluations. Thus, the devaluation and interest rate default triggers would coincide, $\bar{\delta}(\nu)=\delta^R(\nu,\bar{\delta}(\nu))$, and the MVP equilibrium would be risk free. On the other hand, should all loans be dollar denominated, the central bank would resist devaluing as long as doing so would trigger currency risk-induced defaults. However, when failure to devalue triggers an interest rate risk-induced default, financial stability

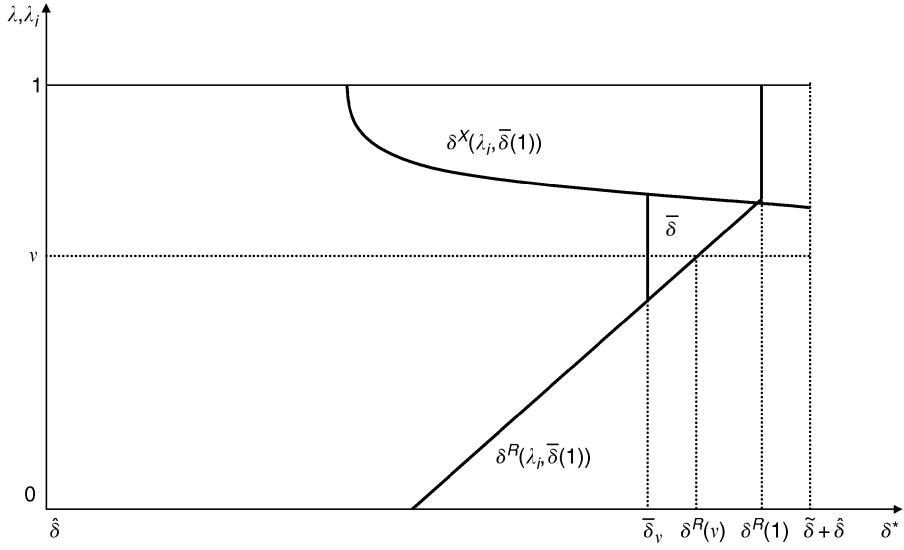

Figure 2.4 The dollarization risk map with an endogenous monetary policy

concerns cancel out. For $\bar{\delta}_v > \delta^R(1,\bar{\delta}_v)$, $\bar{\delta}(1) = \bar{\delta}_v$ and there remains a zone of interest rate risk under high dollarization. For $\bar{\delta}_v \leq \delta^R(1,\bar{\delta}_v)$, the devaluation trigger coincides again with the interest rate risk default trigger (see Figure 2.4). Thus, the endogeneity of monetary policy with respect to dollarization always *eliminates interest rate risk* for loans whose currency composition matches that of the economy (e.g., for $\lambda_i = \lambda$).[16]

In either case, it is easy to see why multiple equilibria can now exist. In a peso (or MVP) economy, the central bank adjusts monetary policy so as to eliminate interest rate risk on peso (or MVP) loans. On the other hand, the more flexible exchange rate boosts the currency risk on dollar loans. Any equilibrium at or below MVP is therefore stable. On the other hand, once the economy is highly dollarized, fear of floating increases, limiting the currency risk associated with dollar loans while increasing the interest rate risk of MVP (and peso) loans. If the interest rate risk of MVP loans exceeds the currency risk of dollar loans, the dollar equilibrium becomes also stable. As shown in Appendix 2.1, the conditions for dollar dominance over the MVP are the same as those given in Proposition 1 for the case of an exogenous monetary policy.

2.5 Alternative paradigms

Imperfect information

Consider now the case where information is imperfect and there are multiple creditor banks. Going to the extreme, suppose that banks cannot observe the currency exposure of the debtor. In this case, creditors behave strategically and *coordination failures* generate inferior equilibria.

If the debtor's currency exposure is not observable and creditors are small, the currency choice made by an individual creditor has no measurable impact on the probability of default. Thus, D^C *is not a function of* λ_i. In contrast, the liquidation losses incurred by the marginal creditor become now a function of his/her currency mix relative to that of other creditors (ϖ *becomes a function of* λ_i). Hence, the preferred currency is that which minimizes expected *loss-given default*, $E\{\varpi(\lambda_i)\}$.

When a devaluation triggers a default, pay-offs to each creditor are proportional to his claims valued at the exchange rate prevailing at the time of liquidation. Thus, dollar claims benefit at the expense of peso claims. Should the economy be heavily dollarized, the presumption should be that debtors borrow in dollars. Hence, no creditor should have any incentive to lend in pesos and the dollar equilibrium should be stable.[17]

Moral hazard

Consider finally the case where $c=\varpi=0$. Thus, only the third term in (7) remains. Banks intermediate in the currency that maximizes the expected cost of the guarantee to the insurer, or, equivalently, the option value of the guarantee to the bank.[18] If the MVP is risk free, the dollar will thus be the preferred currency if:

$$E\{(\rho + k - r^d)/D^B\} < 0 \tag{25}$$

which is the case if:

$$k < R_D^{\star} + \frac{\bar{\delta}(1) + \hat{\delta} + \tilde{\delta}}{2\tilde{\delta}} - \hat{\rho} \tag{26}$$

Thus, banks only become exposed to moral hazard when their capital is low.

As in the case of credit risk, multiple equilibria can also arise when monetary policy is endogenous. To see this, suppose that the economy is intermediating in MVPs. Since MVP intermediation is risk free, banks will not switch to dollars if (25) is not satisfied, which, given the monetary policy associated with the MVP equilibrium, translates into:

$$k > R_D^{\star} + \frac{\bar{\delta}(\nu) + \hat{\delta} + \tilde{\delta}}{2\tilde{\delta}} - \hat{\rho} \tag{27}$$

Thus, when, $\bar{\delta}(\nu) < \bar{\delta}(1)$, there is a range $k \in [R^{\star}{}_D + (\bar{\delta}(\nu) + \hat{\delta} + \tilde{\delta})/2 - \hat{\rho}$, $[R^{\star}{}_D + (\bar{\delta}(1) + \hat{\delta} + \tilde{\delta})/2 - \hat{\rho}]$ for which multiple equilibria (MVP or full dollarization) exist.

2.6 De-dollarization

Strengthening monetary credibility

Let us now examine whether a return to peso intermediation is possible once the economy is dollarized. Consider first the case of efforts to enhance the credibility of monetary policy. Since the culprit in the case of an MVP equilibrium (whether it results from price risk or credit risk) is a lack of monetary credibility, a gradually improving credibility should, *pari passu*, de-dollarize the MVP portfolio, and eventually (as $\nu \to 0$) bring the economy back to a peso equilibrium. De-dollarization should thus be the mirror image of dollarization.

As long as monetary policy is exogenous to dollarization, a broadly similar conclusion applies to the case in which the economy is no longer in the MVP equilibrium but is instead in a highly dollarized equilibrium. In this case, an improvement in monetary credibility should lower $\bar{\delta}$, eventually (if not immediately) altering the balance of risks in favour of the MVP. Thus, at some point, the economy should bounce back to the MVP equilibrium.

The case of an endogenous monetary policy is more complicated. When $\bar{\delta}_{\nu} \leq \delta^R(1, \bar{\delta}_{\nu})$, the key difference with respect to the previous scenario is that once the economy is highly dollarized, the increased fear of floating (the jump from $\bar{\delta}(\nu)$ to $\bar{\delta}(1)$) makes a reversal to MVP impossible even if there is a large improvement in credibility. Indeed, the economy will remain highly dollarized as long as:

$$\tilde{\delta} + \hat{\delta} - \delta^R(1, \bar{\delta}(1)) < \delta^R(1, \bar{\delta}(1)) - \delta^R(\nu, \bar{\delta}(1)). \tag{28}$$

Yet, neither nor $\delta^R(1,\bar{\delta}(1))$ nor $\delta^R(\nu,\bar{\delta}(1))$ are functions of ν (check (22) and (24) for $\lambda_i = \nu$). *Thus, the dollarization trap falls shut and the highly dollarized equilibria exhibit hysteresis.*

Should high dollarization reflect moral hazard or imperfect information, an improvement in credibility will be similarly ineffective. A reduction in ν does not affect the option value of the deposit guarantee, hence has no impact on moral hazard-driven currency choice. Similarly, as long as there exists a range of shocks that induce both a devaluation and a default, and other banks lend in dollars, denominating loans in dollars remains the best 'defensive option' against the risk that claims will become *diluted* during the process of liquidation. Thus, even when peso loans would clearly be less risky if all creditors would lend in pesos, the economy remains fully dollarized.

Flexibilizing the exchange rate regime

Is a move towards a float (the 'just do it' solution) likely to be more effective than building up monetary credibility through gradual institutional reforms? In the pure price risk paradigm, increasing the flexibility of the exchange rate regime (lowering $\bar{\delta}$) can only help de-dollarize if it raises the volatility of the exchange rate relative to the volatility of inflation, thereby raising the risk of dollar investments relative to peso investments. However, such a switch will not help if credibility remains an issue and the volatility of expected inflation rises, *pari passu*, with that of the exchange rate (in terms of the model, lowering $\bar{\delta}$ will only help if it leads to a lower ν). Floating could enhance credibility if it gives the monetary authority a better opportunity to 'prove itself'; however, this is by no means a done deal.

In the perfect information credit risk paradigm, a full float eliminates interest rate risk while maintaining currency risk in the high dollarization region. Thus, it clearly allows the MVP to prevail over the dollar. Moreover, even though the peso may continue to pay a premium (if $\nu > 0$), it is also credit risk-free and, hence, is a (weakly stable) equilibrium. A float can thus also allow the peso to dominate the dollar even when it lacks credibility.

This conclusion is subject to two important caveats, however. First, it does not hold with risk aversion (the MVP will continue to dominate the peso as long as the latter is not fully credible). Second, it assumes no time inconsistency. Should the monetary authority be unable to precommit, the economy can remain in a highly dollarized equilibrium where financial stress concerns continue to dominate, preventing in practice a change of monetary regime.

A less demanding alternative is to follow a more symmetric monetary policy that allows the exchange rate to float upward, at least partly, in the event of an undervaluation. Indeed, by allowing the peso to reap valuation gains in the event of a real appreciation, such a policy reduces the ex ante cost of peso loans relative to the dollar. Admittedly, however, the more depreciations are delayed (the more fear of floating), the less scope there is for the exchange rate to appreciate.

Consider finally the cases of moral hazard and imperfect information. In the case of moral hazard, reducing $\bar{\delta}$ lowers the capital threshold that is required to eliminate moral hazard (check equation 26). By reducing the expected cost to the

insurer conditional on a devaluation, or alternatively increasing the range of outcomes in which bankers lose their capital, a less constrained exchange rate regime lowers the value of the insurance option. Thus, it limits the scope for moral hazard-driven dollarization. In contrast, in the case of imperfect information, enhancing the flexibility of the exchange rate may have a perverse effect if it increases the expected correlation between exchange rate fluctuations and corporate bankruptcies.[19]

Tightening prudential norms

Consider finally the case for a prudential tightening. Should dollarization be volatility driven, a prudential tightening would clearly have no impact. On the other hand, should dollarization be induced by credit risk, a prudenial tightening could affect dollarization if it lessens fear of floating. This could only be the case, however, if the monetary authorities are relatively less concerned by corporate crises than by banking crises.

In contrast, under moral hazard-driven dollarization, a sufficient increase in capital requirements can induce banks to fully internalize risks, prompting them to switch out of dollar lending.

However, two important caveats apply. First, if dollarization also reflects pure default risk, eliminating moral hazard may be necessary to de-dollarize, but not sufficient. Second, if fear of floating is acute ($(\bar{\delta}(1)+\hat{\delta}+\tilde{\delta})/2 \rightarrow \hat{\delta}+\tilde{\delta}$), the required increase in capital requirements that would eliminate moral hazard (although temporary if it succeeds in de-dollarizing the economy) could exceed the usually accepted prudential norms for risk tolerance (an event of an exceptionally large magnitude whose probability is excessively remote). Indeed, with high risk aversion and/or imperfect capital markets, capital could have a high opportunity cost. If so, an increase in capital requirements could result in higher bank spreads and lead to financial disintermediation or alternative, perhaps more risky, forms of intermediation.[20]

2.7 Conclusions

This chapter presented a unified framework to help analyze the roots of FD and address its risks. It showed that domestic financial equilibria may gravitate around interior MVP solutions or shift towards corner (dollar or peso) solutions. Forces supporting the interior MVP allocation arise from both the supply side and the demand side of the loanable funds market. The MVP minimizes borrowers' exposure to credit risk by limiting their balance sheet mismatch. At the same time, it limits lenders' direct exposure to currency risk by providing a fully hedged portfolio. Liquidation costs and risk aversion magnify these effects.

However, the MVP portfolio increasingly approximates the dollar as the credibility of monetary policy declines. Combined with policy endogeneity (which minimizes the risk associated with dollar loans), asymmetry (which turns dollar loans into one-sided bets) and the existence of an overvaluation overhang (which further raises expected returns on dollar loans in the event of a large

depreciation), the low credibility of monetary policy can boost the dollar to the point where highly (or fully) dollarized mixes become stable equilibria. While such equilibria are inferior to MVP equilibria, a shift from a highly dollarized equilibrium to MVP becomes problematic once the economy becomes highly dollarized (there is dollarization hysteresis).

Moral hazard and market imperfections further push towards full corner solutions. Official guarantees (reflecting, as in the case of monetary policy endogeneity, policy-makers' concerns for financial stress and inability to precommit) boost the dollar (peso) in an economy that is already dollarized (pesoized), hence exposed to currency-induced credit risk (interest rate-induced credit risk). Market frictions (imperfect information and costly contracting) similarly favour the dollar (peso) by preventing coordination between multiple creditors. When bankruptcy proceeds are allocated proportionally among all creditors at the exchange rate (real interest rates) prevailing at the time of the bankruptcy, it is individually optimal (but socially suboptimal) for a marginal creditor to denominate his loan in dollars (pesos).

Policy implications towards de-dollarization depend on the underlying roots of dollarization and whether it reflects an MVP equilibrium or an alternative highly (or fully) dollarized equilibrium. In the former case (which is more likely in economies with moderate and stable dollarization), policy should concentrate on enhancing the credibility of monetary policy through institutional reform and capacity building. By clarifying policy preferences, the introduction of an inflation targeting-type regime should help. Floating, or at least increasing the flexibility of the exchange rate, can also help by providing better opportunities for the central bank to demonstrate its managing skills, thereby building up its credibility.

Policy options are less straightforward for highly dollarized equilibria or where dollarization is increasing rapidly (reflecting the transition from an interior to a corner solution). Improving monetary credibility may not be sufficient to dislodge the economy from its high dollarization equilibrium (or reverse dollarization dynamics). Moreover, switching the monetary regime is difficult when financial stability concerns overwhelm monetary policy. In addition, monetary policy shifts are unlikely to have much effect and might even be counterproductive when dollarization reflects coordination failures between market participants.

In such extreme cases, policies that might help de-dollarization include: (i) institutional reforms that aim at reducing bankruptcy costs (thereby reducing fear of floating); (ii) the promotion of price-indexed instruments that constitute a better immediate substitute to the dollar and provide a midway station towards the peso;[21] and (iii) administrative measures to directly reduce (or eliminate) dollarization. By allowing for a discrete change in monetary policy and *a coordinated move by all borrowers from dollar borrowing to peso borrowing*, the latter may help speed up the de-dollarization process (thereby limiting transition costs). However, this requires a sufficient concomitant improvement in credibility to ensure that the peso equilibrium is stable. The economy will otherwise re-dollarize or disintermediate.

Appendix 2.1 Default equilibria and monetary credibility

Peso and MVP equilibria

Setting $\bar{\delta}=\bar{\delta}_v = av/\mu$ in (22), defining $Y = \bar{\delta}/\tilde{\delta}-\delta^R/\tilde{\delta}$, and picking the root $Y\in[0,1]$ leads to the following expression:

$$Y = 1 + (\varpi/\mu\tilde{\delta})- \left[(1 + (\varpi/\mu\tilde{\delta}))^2 + 2\,\frac{d/\tilde{\delta} - av}{\mu} + 2\,\frac{\lambda_i - \nu}{1 - \nu}\,\frac{\Delta}{\mu\tilde{\delta}}\right]^{\frac{1}{2}} \tag{A-1}$$

For the peso equilibrium ($\lambda_I = 0$), it can be immediately checked that $\partial Y/\partial\nu > 0$ and Y goes from negative to positive as ν rises from zero to one. Thus, the peso equilibrium is riskless if credibility is high but becomes risky as credibility declines. On the other hand, since high dollar mixes are exposed to currency risk, they are clearly dominated by high peso mixes.

Since $\partial Y/\partial\lambda_i < 0$, any shift into a more dollarized mix would continue to be riskless as long as $\lambda_i \leq \nu$ (it does not induce currency risk). However, no marginal shift towards the peso could occur as such a shift would face an immediate increase in interest rate risk, reflecting the positive slope of the δ^R schedule. Thus, the peso equilibrium is weakly stable as long as it is riskless. However, once the peso becomes risky, a shift into a more dollarized mix, that ensures $\bar{\delta} = \delta^R$, becomes preferable. At that point, λ is obtained by setting $Y = 0$ in (A-1), as:

$$\lambda = \nu + (1 - \nu)\,\frac{av\tilde{\delta} - d}{\Delta} \tag{A-2}$$

Thus, provided $d/\tilde{\delta} < a$, dollarization eventually reaches the MVP region. Once there, a small shift towards the dollar faces increased interest rate risk but no currency risk. However, a larger shift eventually faces a large increase in currency risk. Therefore, there must be a mix, slightly above MVP, that is fully stable.

Dollar equilibria

There can only be a jump from the MVP equilibrium to the highly dollarized equilibrium if the sum of interest rate and credit risk in the dollar region is less than the interest rate risk in the MVP region:

$$\tilde{\delta}+\hat{\delta}-Min\{\bar{\delta}_v,\delta^R(1)\} < \bar{\delta}_v-\delta^R(v) \tag{A-3}$$

Consider the more general case where $\delta^R(1) < \bar{\delta}_v$ and define $X = (\tilde{\delta}+\hat{\delta}-\delta^R(1))/\tilde{\delta}$. Subtract (22), expressed for $\lambda_i = \nu$, from (24). After some rearrangements, this can be written as:

$$(Y-X)[1-\varpi/\mu\tilde{\delta})-(X+Y)/2]-[\tilde{\delta}+\hat{\delta}-\bar{\delta})/\tilde{\delta}][\bar{\delta}/\tilde{\delta}-(\tilde{\delta}+\hat{\delta}-\bar{\delta})/2\tilde{\delta}] = 0 \tag{A-4}$$

It immediately follows that $Y-X>0$ if $\bar{\delta}>(\tilde{\delta}+\hat{\delta}-\bar{\delta})/2>0$ and $\varpi/\mu\tilde{\delta}<1-(X+Y)/2$; this last condition can be written:

$$\varpi/\mu\tilde{\delta} < (\tilde{\delta}+\hat{\delta}-\bar{\delta})/2\tilde{\delta} + (\delta^R(v)-\hat{\delta})/2\tilde{\delta} + (\delta^R(1) - \hat{\delta})/2\tilde{\delta} \tag{A-5}$$

For $\bar{\delta},\delta^R(v)$, $\delta^R(1) \in [\hat{\delta},\tilde{\delta}+\bar{\delta}]$, $\mu > 0$, this defines a positive upper bound for ϖ. In addition, the condition $\delta^R(1)/\bar{\delta} < 1$ must also hold, which, with (24), leads to:

$$\mu\,\frac{\bar{\delta}^2 - \hat{\delta}^2}{2\tilde{\delta}} < d < \mu\,\frac{\bar{\delta}^2 - \hat{\delta}\bar{\delta}}{\tilde{\delta}+\hat{\delta}-\bar{\delta}} \tag{A-6}$$

It can be immediately checked that for $\bar{\delta} \in [\hat{\delta}, \tilde{\delta}+\hat{\delta}]$ this range is non-empty; moreover its upper bound vanishes as $\bar{\delta} \to \tilde{\delta}+\hat{\delta}$. It is also easy to check with (19) that the condition $\delta^X(1) < \bar{\delta}$ is satisfied if (A-5) is satisfied and $\mu < 1$.

The conditions for dollar dominance apply to the limit case in which $\bar{\delta}(1) = \delta^R(1)$. Thus, they extend to the case with an endogenous monetary policy.

Notes

1. This chapter benefited from comments by Adrián Armas, Olivier Jeanne, Eduardo Levy Yeyati and Rodolfo Maino.
2. For a recent review of dollarization trends and risks, see de Nicoló, Honohan and Ize (2005).
3. Key contributions in this direction were made by Calvo and Guidotti (1989), Ize and Levy Yeyati (1998), Burnside, Eichenbaum and Rebelo (2001), Chamón (2001), Aghion, Bacchetta and Banerjee (2001), Jeanne (2002) and Broda and Levy Yeyati (2003).
4. In a more complete model, the range of exchange rate shocks would include values of δ below $\hat{\delta}$ or in the negative range, reflecting the fact that the distribution of shocks should be broadly symmetric (it should also include undervaluation shocks). However, as long as the exchange rate peg is maintained under undervaluation shocks (with adjustments towards the equilibrium exchange rate taking place through price adjustments rather than nominal appreciations), the returns on all currencies would be equally affected over that range. Hence, making the distribution of shocks symmetric would complicate the model without affecting currency choice. For simplicity, I will thus exclusively focus on overvaluation shocks. Notice however that the asymmetric monetary policy response to overvaluations and undervaluations is a key feature underlying the competitiveness of the dollar relative to the peso (this point is addressed later in the chapter).
5. The borrower can be viewed as a representative firm that exports part of its output. A devaluation (overvaluation) increases (reduces) profits because it increases (reduces) the price of the tradable share of the firm's output and, through substitution effects, increases (reduces) demand for the non-tradable component.
6. When a debtor has multiple creditors and lending mixes are not identical across all creditors, the liquidation cost becomes a function of relative mixes (more on this below).
7. There is some evidence that depreciations tend to be contractionary in highly dollarized economies (see Galindo, Panizza and Schiantarelli [2003]).
8. The perceived monetary weaknesses could in turn result from a weak fiscal environment.
9. Notice that banks do not internalize the liquidation costs (both from corporates and from banks) that occur when they default. Thus, eliminating moral hazard is not equivalent to fully internalizing risks.
10. This is the basic result in Ize and Levy Yeyati (1998). It is easy to show that MVP dollarization can also be expressed as the ratio of the standard deviations of the exchange rate and the price level, times their correlation.
11. However, the MVP only protects against inflation to the extent that the expected pass-through equals the actual pass-through.
12. For $\delta^X < \bar{\delta}$, the δ^X schedule is 'notional'. It determines the exchange rate that would trigger a default in the absence of fear of floating.
13. Contingent contracts that fully tie the returns on the loan to that of the project would of course dominate dollar contracts if they were available.
14. That agents can prefer the dollar to the MVP (i.e., a fully credible peso) under high fear of floating is the basic result in Jeanne (2002).
15. That agents prefer the dollar to the peso under low monetary credibility is reminiscent of Calvo and Guidotti's (1989) finding in the context of public debt that the viability of nominal contracting in local currency shrinks drastically under expectations of severe inflation. The result extends here to the case of private contracts.
16. This implies that the region of interest rate risk-induced crises disappears *for the economy as a whole* (although not for an individual borrower who borrows more in pesos than the

average). This is consistent with the fact that currency-triggered financial crises seem to recur more frequently than overvaluation-induced crises.

17. Inversely, when the default is induced by an overvaluation, peso contracts benefit over dollar contracts since they carry a higher nominal interest rate. Thus, by the same reasoning as in the case where dollar lending dominates, the peso equilibrium should also be stable.
18. This result was first obtained by Burnside, Eichenbaum and Rebelo (2001). It is consistent with Broda and Levy Yeyati (2003), who find that, with *currency-blind risk premia*, deposit insurance contributes to dollarization.
19. Paradoxically, the only case in which the dollar would lose its edge over the peso in a dollarized economy would be if fear of floating becomes so extreme that devaluations are ruled out under any circumstance, in which case currency denomination becomes irrelevant.
20. Instead, introducing high capital requirements on dollar loans in a non-dollarized economy has no cost.
21. Unlike the MVP, price-indexed instruments do not require multiple currency contracting, and fully protect contracts against all inflationary surprises. Nonetheless, price-indexed markets may not take off by themselves and may require substantial and sustained promotional efforts. See Herrera and Valdés (2004).

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Comments on Chapter 2

Olivier Jeanne

Before focusing on dollarization, I would like to broaden the perspective by noting that it is part of the larger question of why emerging market borrowers tend to have 'risky' (crisis-prone) balance sheets. This question has several dimensions: the currency composition of debt, of course, but also its maturity, and (for corporate borrowers) the choice between debt and equity. We still have a lot to learn about the determinants of liability structures in emerging market countries, and this paper makes a very useful contribution.

Alain Ize focuses on liability dollarization. He presents a very nice framework that encompasses the main angles from which one can approach this question. This is a very useful and ambitious paper that reviews some possible causes of dollarization in the context of a single theoretical framework. Like some of Ize's earlier work, it starts from the premise that it is important to understand the underlying cause of dollarization to determine the cure. This is a premise that I share completely.

One very important theme is that dollarization can reflect optimal hedging by the borrower. Let me illustrate this point with an example. Consider a firm in an emerging market country that borrows to finance an investment. There are two periods. In period 1, the domestic currency (the peso) is pegged to the foreign currency (the dollar) at a rate of one peso per dollar. There could be devaluation in period 2. The stochastic distribution of the exchange rate in period 2 is given by,

1 peso = 1 dollar with probability 90 per cent,

1 peso = 1/2 dollar with probability 10 per cent.

That is, there is a 10 per cent probability that the fixed peg will be abandoned and the currency will be devalued by 50 per cent.

The firm must make an indivisible investment of 100 pesos (or dollars), which will pay off

170 pesos with probability $\frac{1}{2}$

110 pesos with probability $\frac{1}{2}$.

I further assume that the peso return does not depend on the exchange rate (i.e., there is a zero pass-through). Thus, we are considering a firm in the non-tradable sector that takes a significant foreign exchange risk by borrowing in dollars. The other assumptions are that the debt market is perfectly competitive and lenders are risk neutral. The riskless dollar interest rate is 5 per cent. If there is a default, the creditors collect the investment's pay-off.

The following table shows the equilibrium interest rate and probability of default for peso debt and for dollar debt. The probability of default is higher for peso debt than for dollar debt. This is because a peso-indebted firm defaults whenever the peso return is low (since $111.1 > 110$), which occurs with probability 1/2, while a dollar-indebted firm defaults whenever there is a devaluation, which occurs with probability 1/10.

	Interest rate	*Probability of default*
Peso debt	11.1%	50%
Dollar debt	8.9%	10%

The numbers for the equilibrium interest rates can be checked by computing the lenders' expected pay-off in dollars. With peso debt it is,

$$(0.5 \times 111.1 + 0.5 \times 110) \times (0.9 + 0.1/2) = 1.05,$$

so the expected dollar return is 5 per cent, as it should be. Similarly with dollar debt we have,

$$0.9 \times 108.9 + 0.1 \times (0.5 \times 170 + 0.5 \times 110)/2 = 1.05.$$

If we assume that the firm minimizes the probability of default, then it should borrow in dollars. Dollar debt is less risky than peso debt.

One further paradox of this example is that the firm will switch to dollar debt when the probability of devaluation is high. Denoting by p the probability of a devaluation, it is straightforward to show that if $p < 9.1$ per cent (a credible fixed peg), the default probabilities are given by

	Probability of default
Peso debt	0
Dollar debt	p

while if $p > 9.1$ per cent (a non-credible fixed peg), we have

	Probability of default
Peso debt	0.5
Dollar debt	p

Thus dollar debt dominates when p is larger than 9.1 per cent.

Although very simple, this model has some policy implications. De-dollarization policies that work (in the model) include:

- improving the credibility of the fixed peg (set $p < 9.1$ per cent).
- making the exchange rate risk symmetric (i.e., having a probability $\frac{1}{2}$ of depreciation or appreciation): this can be interpreted as *credible floating*.
- creating a liquid market for currency options.

By contrast, policies that don't work include a regulation (or tax/subsidy) that forces firms to borrow in pesos.

However, those policy conclusions may not hold in an extended version of the model with impediments to financial innovation. Then monetary credibility might be a necessary but not sufficient condition for de-dollarization, and regulation could be justified. Let me show this with a simple extension of the model.

I assume the economy has 1,000 firms like the one I have described. A market for peso debt, furthermore, can exist if a critical mass of at least 100 firms borrows in pesos. This could be due to the need for liquidity, or for investors to invest in the human capital that is required to trade in peso-denominated instruments. Then if the fixed peg is sufficiently credible ($p < 9.1$ per cent), there are two equilibria: a bad equilibrium in which all firms borrow in dollars, and a good equilibrium in which all firms borrow in pesos. The bad equilibrium exists because the critical mass requirement makes it impossible for one individual firm to switch to peso debt alone.

In this model the good equilibrium can be selected by quantity or price regulations that tip individual choices towards peso debt (for example, taxing dollar debt or subsidizing peso debt). Thus, monetary credibility and financial regulation complement each other in creating a market for peso debt. Monetary credibility is necessary for the good equilibrium to exist. Financial regulation then ensures that the economy is in the good equilibrium. This raises the important issue of sequencing: should countries establish monetary credibility first and then focus on removing the impediments to financial innovation, or should these policy efforts proceed in tandem?

3

Financial De-dollarization: Is It for Real?

Alain Ize and Eduardo Levy Yeyati[1]

3.1 Introduction

Some important events and trends in recent years have intensified concerns about FD. First, there is mounting evidence that FD has increased or remained stable despite declining inflation rates. Second, dollarization has greatly complicated the policy response in several crises and near-crisis episodes and, in some cases, has been singled out as the source of financial vulnerability that triggered a crisis. Third, the widespread shift from fixed to more flexible exchange rate regimes has altered the policy landscape, highlighting the prudential consequences of exchange rate risk. As a result, the policy debate about de-dollarization has heated up. Is de-dollarization a realistic goal? Is it worth the trouble? If so, how can it be pursued? Guided by these questions, this chapter tries to summarize where we stand on what remains a continuing debate.

The chapter focuses on de facto (unofficial) dollarization, defined as the holding by residents of assets and liabilities denominated in a foreign currency that does not enjoy legal tender status. More precisely, the chapter centres on domestic dollarization (i.e., financial contracts between domestic residents such as onshore deposits and loans) rather than external dollarization (i.e., financial contracts between domestic and external residents such as external bonded debt), and on asset-liability dollarization rather than on currency substitution (i.e., the use of the foreign currency for transaction purposes).[2]

Based on a comprehensive review of the theoretical and empirical literature, we address the following questions:

- How much do we know about the causes and dynamics of de facto dollarization?
- What are the key *strategic* policy options? Should countries
  - aggressively seek to de-dollarize and, if so, should de-dollarization be viewed strictly as a by-product of good economic management (combat the causes rather than the symptoms) or should it be pursued as a goal in itself (which may require direct action to limit or reverse dollarization)?

- accept dollarization but learn to live with it by limiting its downside and improving policy within the confines of a dollarized environment (better to bend than to break)?
- call it quits and fully (officially) dollarize?

The chapter also sets the stage for more detailed and focused discussions on a number of key *tactical* issues: (i) how (and how aggressively) to de-dollarize; (ii) how to conduct monetary policy in a dollarized economy (and how to conquer the fear of floating); (iii) how to implement prudential reform; and (iv) how to promote local currency markets.

With this road map in mind, Section 3.2 lays the groundwork for the policy discussion by reviewing existing theories of de facto dollarization. Section 3.3 examines the extent to which the empirical evidence allows us to differentiate in practice between these competing theories. Section 3.4 provides the necessary underpinning for policy reform by briefly discussing the costs and risks of dollarization. Section 3.5 presents the main strategic options for reform. Section 3.6 concludes by proposing a list of policy recommendations as a function of the type and extent of dollarization.

3.2 Financial dollarization as financial equilibrium: theories of de facto dollarization

Any theory of FD must be supported by a consistent model in which *FD is the outcome of a financial equilibrium* between creditors and borrowers, with both optimizing the currency composition of loan contracts. Unlike payments dollarization (currency substitution), FD is immune to systematic differences in rates of return (through arbitrage, interest rates adjust to equalize ex ante rates of return).

Instead, FD is all about risk differences. *Dollars are preferred to pesos because they are perceived to be less risky*. There are, however, two quite distinct ways to introduce risk, and these lead to models and paradigms with partly overlapping yet somewhat different focuses and policy implications. In turn, market, structural and institutional characteristics affect the equilibria obtained under these paradigms. We will thus divide our review of the sources of FD into three categories. The first two stress differences in basic ways of modelling FD and, in particular, the role risk plays in the choice of currency in financial contracts. The third stresses different ways of combining these models, based on certain key characteristics of the financial environment.

The price risk portfolio paradigm

The easiest way to introduce risk is through uncertainty of real returns. This is the main starting assumption of the portfolio paradigm, which views FD as the result of an optimal portfolio choice by risk-averse lenders (and borrowers) responding to the probability distribution of real returns in each currency in a world with price risk but no credit risk. Somewhat different perspectives are obtained depending on whether a simple capital asset pricing model (CAPM) model or a consumption CAPM (CCAPM) model is used.

Under a CAPM model, risk-averse agents choose the currency composition that optimizes the risk-return profile of their portfolio, measured in units of the local consumption basket. In the simplest set-up, the balance of the supply and demand of loanable funds in each currency leads to uncovered interest rate parity (UIRP) and an MVP allocation (Ize and Levy Yeyati, 2003).

In the absence of portfolio rebalancing transaction costs, the model shows that what matters is the *relative volatilities of inflation and the real exchange rate depreciation,* or, alternatively, the covariance of inflation and the *nominal* exchange rate relative to their variance (the 'beta').[3] In turn, the beta is a measure of the exchange rate pass-through.[4] The dollar is preferred if the real exchange rate (which determines the volatility of real returns on dollar instruments) is stable relative to the inflation rate (which determines the volatility of real returns on peso instruments).[5]

Instead, with rebalancing costs, what matters is the *relative volatilities of peso and dollar real interest rates*. The dollar is preferred if dollar interest rates are more stable than peso rates.

Several interesting implications follow. First, a monetary policy that fails to stabilize inflation or that closely targets the real exchange rate stimulates dollarization. Thus, the observed dollarization hysteresis (i.e., the persistent dollarization after years of subdued inflation rates) may be the result of exchange rate-based stabilization efforts that stabilize inflation *and* the real exchange rate simultaneously (i.e., that reduce *absolute* volatilities without modifying *relative* volatilities). Second, FD should increase with the degree of openness and the presence of real dollarization (dollar pricing), as both induce a closer correlation between exchange rate and inflation shocks (a higher pass-through). Third, *ceteris paribus*, resident savers (borrowers) favour the local currency, as peso instruments mirror more closely their stream of future consumption (income).[6] For the same reason, from the standpoint of the resident investor, real assets (such as deposits indexed to the consumer price index, or CPI) should generally dominate dollar assets, as they minimize (or eliminate) the variability of real returns.[7]

Finally, the model highlights the role played by expectations and credibility. Exchange rate pegs are the clearest example. If the peg is fully credible, the dollarization ratio is undetermined, since both currencies are indistinguishable. FD is then driven by other considerations (e.g., the liquidity services played by each currency). However, if the peg is not fully credible, dollarization is explained by the distribution of the exchange rate and inflation (hence how monetary policy is expected to be managed) *after the collapse of the regime, no matter how improbable such a collapse*. Thus, because lack of credibility is persistent, improvements in monetary policy that would seem to favour the peso (as measured on the basis of recently observed volatilities) may fail to have any immediate impact on dollarization.[8]

The CCAPM version of the previous model extends portfolio smoothing to total incomes (rather than financial incomes exclusively). This introduces a *safe haven* effect as an additional determinant of FD. When economic activity (hence, consumption) is negatively correlated with the exchange rate, investors tilt their portfolios towards the dollar.[9] Thus, one would expect economies that have been frequently hit by sudden stops or political disturbances, resulting in sharp economic

downturns and exchange rate depreciations, to exhibit a stronger preference for the dollar.[10]

CCAPM models have also been used to analyze the interaction between real dollarization (the dollar denomination of price or wage contracts) and FD. If the foreign currency protects real incomes from shocks better than the local currency, reflecting a pro-cyclical or erratic monetary policy and a strong correlation between domestic and international shocks, wages become dollar-denominated, raising the pass-through and FD (Ize and Parrado, 2002).

In all cases, a distinctive characteristic of the portfolio models is that FD reflects an optimal response to the distribution of returns resulting from a possibly suboptimal policy environment. Thus, while FD is an unavoidable, and indeed healthy, outcome in a small economy largely open to trade, it may be a pathological manifestation of a poorly managed currency in a larger and/or more closed economy where the real value of the currency is simply too volatile to serve as store of value. In this latter case, improving monetary management is the natural policy recommendation (*only 'good' products sell*).

However, this is easier said than done. The weak monetary policy is not there by accident, and generally reflects a limited mandate following past mishaps that have eroded confidence in the monetary authority's capacity to do better (Cowan and Do, 2004). Broadening this mandate requires credibility, but getting credibility requires experience under a broader mandate: an asymptotic process that involves time and political costs.

The credit risk paradigm

This approach differs from the previous one in that it shifts the focus from the volatility of returns as seen by risk-averse agents to the decisions of risk-neutral agents *in the presence of default risk*. This paradigm leads to different conclusions and highlights different channels of dollarization, depending on the market imperfection at play (market frictions, information asymmetries, distortions induced by deposit or government guarantees).

Perfect information

With perfect information, creditors fully internalize credit risk so that ex ante returns, including expected losses under default, equalize across currencies. At the same time, with limited liability, debtors prefer the currency for which the expected cost is lower in the event of no default. When liquidations are costly, the interaction of these two conditions results in the preferred currency being the one that limits expected bankruptcy costs, *hence credit risk* (Jeanne, 2002). The dollar is preferred when the probability of devaluation is small yet the peso premium large enough to induce an *interest rate-induced credit risk on peso loans that is larger than the currency-induced credit risk on dollar loans*. This situation is typical of economies where there is a 'fear of floating' or a pegged or quasi-pegged regime. By delaying needed policy responses to exchange rate misalignments, fear of floating limits the scope for currency risk while increasing that for interest rate risk. The less credible monetary policy is, the higher the ex ante nominal peso rate, the stronger

the interest rate risk associated with peso lending and, hence, the stronger the dominance of the dollar over the peso.[11] However, even a fully credible currency (in the sense of a minimum expected pass-through) can be dominated by the dollar when fear of floating is acute and exchange rate overvaluations have a sufficiently strong impact on output, making the profile of debtors' repayment capacity more similar to that of dollar returns.

This paradigm puts the spotlight on the peso premium, since the latter is what makes peso loans more costly than dollar loans – hence more risky – in the event of no devaluation. Rigid exchange rate regimes tend to elicit an *asymmetric monetary response* that adjusts for undervaluations through price increases (instead of nominal appreciations) but which, due to nominal price rigidities, belatedly corrects for overvaluations through sharp nominal exchange rate devaluations. *In such policy environments, the dollar benefits relative to the peso due to the fact that it becomes a one-sided bet: its value can only go up, never down.*[12] Thus, the asymmetry of monetary policy penalizes the peso as much as its lack of credibility (Ize, 2006, Chapter 2 of this volume).

The endogeneity of monetary (exchange rate) policy also plays an important role. Once an economy is dollarized, the monetary authority may prefer a peg to a float, reflecting concerns for the financial stress caused by exchange rate devaluations in the presence of currency mismatches and balance sheet effects (Chamón and Hausmann, 2003; Ize, 2006, Chapter 2 of this volume).[13] Thus, the exchange rate distribution is strongly biased, with small (or no) change in most of the states, and long positive tails reflecting a minor probability of a sharp currency collapse. Inversely, once an economy intermediates in pesos, the monetary authority will avoid overvaluations that raise credit risk through high peso rates. Monetary policy endogeneity can thus lead to corner solutions in which full dollarization or full pesification are optimal, *given the monetary regime*.[14] In either case, the endogeneity of monetary policy induces hysteresis.

What does this model tell us about policy? As in the portfolio paradigm, dollarization is an *optimal (prudential) response to a suboptimal policy environment*. Currency diversification also has benefits, but for different reasons. Here, unless monetary policy endogeneity moulds the monetary regime to fit the dollar, the MVP composition is optimal (at least for the economy as a whole) because it matches the loan to the income flow of the average borrower (hence its price response to a depreciation).

Also as in the portfolio paradigm, the solution is monetary. Allowing the exchange rate to be more flexible (*in both directions*) alters relative risks in favour of the peso. But, again, the policy recommendation should be qualified. The inability to precommit limits the feasibility (and credibility) of a change in the current monetary regime, which is optimal given the high dollarization (high dollarization provides its own seed). In turn, if the promise of a regime change is not time consistent, banks and supervisors should continue to assess risk (and choose the currency composition) based on the current regime.

But the model also points at institutional aspects. In particular, reducing liquidation costs (length of the bankruptcy procedure, judiciary costs, corruption) can reduce FD by limiting fear of floating.

Imperfect information

In the context of imperfect information where creditors cannot observe the currency exposure of the borrower, the marginal creditor cannot be sure that his mix is the same as that chosen by other creditors. Hence, he behaves strategically and chooses the mix that best protects him in a situation where – in the absence of enforceable contingent contracts or creditor coordination – first-best equilibria are not attainable. This leads again to corner solutions (full dollarization or full pesification).

Incentives for dollarization are exacerbated by the fact that the residual value of the failed investment is distributed among creditors on a pro rata basis. Dollar creditors fare better than peso creditors in default states due to the higher exchange rate that dilutes the value of residual peso claims relative to dollar claims.[15] This dilution effect results in the dollar being preferred to the peso *when the probability of default is perceived to be associated with a high exchange rate* (Broda and Levy Yeyati, 2003).[16]

Here, the roots of dollarization are *market failures rather than policy failures*. Dollarization is a suboptimal response to a policy environment that may not necessarily be suboptimal. As long as a positive correlation between default risk and depreciation risk remains, which is likely to be the case in a highly dollarized economy, creditors are likely to continue lending in dollars. Thus, marginal policy reforms are unlikely to be effective.[17]

Moral hazard and prudential regulation

When deposits are guaranteed or banks (or firms) are bailed out in the event of bankruptcy, creditors may again no longer fully internalize credit risk. Instead, unless they have enough to lose in the event of default (i.e., enough capital at risk), they intermediate in the currency that maximizes *the option value of the implicit guarantee*.[18] The dollar is therefore preferred because it allows banks and their corporate borrowers to benefit from low interest rates in normal times and to pass on to the government, the deposit insurer, or the central bank the cost of servicing dollar obligations and rescuing failed financial or commercial institutions in the event of large depreciations (Burnside, Eichenbaum and Rebelo, 2001; Broda and Levy Yeyati, 2003).[19]

As before with exchange rate policy, the ex post distribution of costs of a currency meltdown may be endogenous (and thus, anticipated by the agents) due to time inconsistency. Even in the absence of explicit guarantees, creditors may perceive that there will be a bail-out in the event of massive financial distress induced by a currency collapse. Similarly, the central bank's capacity to provide *liquidity assistance* in foreign currency also enhances moral hazard and promotes the dollar by reducing banks' incentives for costly holdings of foreign reserves (Dooley, 2000; Ize, Kiguel and Levy Yeyati, Chapter 9 of this volume).[20]

Currency-blind prudential regulation that fails to reflect currency-specific risks exacerbates this problem and further benefits the dollar at the expense of the peso. Uniform deposit insurance and standard lender of last resort (LOLR) practice provide clear illustrations (Broda and Levy Yeyati, 2003). The same applies to prudential

banking regulation, which emphasizes limits on open currency positions but disregards the potential currency mismatch of dollar debtors in the computation of capital requirements (Gulde *et al.*, 2004; Levy Yeyati, Martínez Pería and Schmukler, 2004).[21]

In this paradigm, dollarization is a *suboptimal response to a suboptimal policy environment*. Dollar intermediation is again a one-sided bet, but this time reflecting the policy-maker's inability to precommit. While there is no simple way out of the time inconsistency problem (massive defaults will almost surely elicit a response from the government), there certainly is room to address the prudential problem, ensuring that risks are fully internalized by all market participants through proper prudential requirements.

The financial environment

Dollarization should reflect the environment in which financial markets operate. In part, this reflects 'facts of life', for example, the size of the country and its integration (or lack of) with the world economy. But it also reflects the relative depth and efficiency of peso markets versus dollar markets, and the legal environment.

Small economies in a globalizing world

All else being equal, countries that are more open to trade should be more dollarized, and dollarization should increase with trade integration. This view is based on both risk aversion models and credit risk models (Ize and Levy Yeyati, 2003; Luca, 2002). Similarly, in countries that have open capital accounts and become increasingly exposed to world shocks, the benefits of an independent currency decline and dollarization, both real and financial, should increase (Ize and Parrado, 2002). Because they are likely to be more open, smaller countries may thus be more dollarized. In this paradigm, dollarization is an optimal response to an environment that is given and unchangeable. Dollarization is therefore 'good', and repressing it is at best an unfeasible policy, and at worst a harmful policy.

Market and legal imperfections

Dollarization may also arise because market or legal imperfections give an artificial edge to the dollar. On the domestic front, the existence of efficiency asymmetries – specifically, the existence of more efficient offshore intermediaries *that only intermediate in dollars* – induces dollarization through 'offshorization' and by forcing domestic intermediaries to raise their peso margins so as to compensate for compressed dollar margins (Calvo, 2001; Ize and Powell, 2004).[22]

On the international front, some observers have claimed that emerging economies are unable to borrow internationally in the local currency (Eichengreen and Hausmann, 1999; Eichengreen, Hausmann and Panizza, 2003b). The fact that economic size is virtually the only variable consistently related with external FD suggests that it may be a reflection of micromarket factors such as non-linear transaction costs, network externalities, benchmarking and, most notably, liquidity risk that favour the broader and deeper dollar markets.[23]

However, an alternative reason why international markets are not amenable to exotic currencies is suggested by the portfolio approach, which indicates that the local currency is more attractive to residents than to foreigners (Levy Yeyati, 2004).[24] Yet another potential explanation is *lower liquidation costs*: the larger the recovery value, the greater the dollar advantage (de la Torre and Schmukler, 2004). Thus, more efficient offshore legal arrangements (which may involve shorter bankruptcy procedures as well as less corruption and better creditor rights) enhance the attractiveness of the dollar in international contracts. At any rate, the absence of international peso markets implies that 'offshorization' automatically translates into a narrowing of peso funding and greater dependence on dollar financing.

In this view dollarization is a *market response to suboptimal market, legal or regulatory asymmetries that favour the dollar*. This paradigm offers the clearest case for government intervention and policy reform. Levelling the playing field by removing distortions, promoting local currency markets and improving the legal framework are obvious policy implications. Yet, this path is not without problems, either. The constraints imposed by market size could be insurmountable: small countries may face an uphill task in developing peso liquidity – although fully funded pension funds have typically helped on this front. In addition, once local dollar markets have developed in a highly dollarized economy, the marketplace may become crowded and de-dollarizing through developing peso markets may become more difficult (this type of hysteresis is similar to that of the early literature on currency substitution).

3.3 What guidance does the empirical evidence provide?

The hypotheses discussed in the previous sections have started to be systematically tested only recently and in ways that are fragmentary at best, mostly because of a lack of data, both on measures of FD and on reasonable proxies of the different theories. The fact that some of these theories have similar implications further complicates the empirical validation. We first briefly review the evidence in favour of a 'structural' view of dollarization. We then review the extent to which dollarization is explained by MVP, as measured by observed volatilities and pass-throughs. We then discuss the evidence suggesting that 'expected' MVPs might actually be much higher than 'observed' MVPs, reflecting a lack of monetary credibility and expectations of regime changes. We conclude by examining the extent to which 'excess dollarization' may be explained by the existence of non-MVP, highly dollarized corner solutions reflecting monetary policy endogeneity, market imperfections and moral hazard.

MVP-based explanations of dollarization

De Nicoló, Honohan and Ize (2003) and Levy Yeyati (2006) represent the main efforts to test many of the previous aspects. Starting with globalization factors, based on static cross-country regressions, both studies find that *trade openness does not appear to matter*, suggesting that other factors dominate (i.e., dollarization is

generally higher than would be warranted by trade globalization). However, better intertemporal estimates are needed (there is some limited evidence in de Nicoló, Honohan and Ize [2003] that countries that are more open dollarize more rapidly). There has been no attempt to link increasing dollarization with increasing globalization of shocks and economic cycles (financial globalization). Finally, there is evidence that *size matters* for external dollarization (Eichengreen, Hausmann and Panizza, 2003a and 2003b; de la Torre and Schmukler, 2004), but not for domestic deposit dollarization (Levy Yeyati, 2006).[25]

Both de Nicoló, Honohan and Ize (2003) and Levy Yeyati (2006) find convincing cross-country evidence that the MVP explains a significant share of dollarization at the expense of the inflation rate, confirming early results in Ize and Levy Yeyati, 2003.[26] While the interest volatility version of the portfolio model has not yet been tested, due to difficulties in obtaining data on dollar interest rates for a broad cross-section of countries, the generally much greater volatility of peso interest rates (particularly on the lending side) in dollarized economies (Barajas and Morales, 2003) is also consistent with the view that *relative volatilities matter*.[27] In addition, there is some solid country-specific evidence directly supporting the portfolio view. In particular, in the context of regime changes, borrowers are more inclined to hedge their risks after exchange rates become more volatile (Martinez and Werner, 2001; Goldstein and Turner, 2004; Kamil, 2005). The better performance of local currency bond markets in countries with better macroeconomic records and institutions (Burger and Warnock, 2003) can also be viewed as generally supportive of the portfolio approach.

There is as yet no systematic attempt to test for peso premia. While fragmentary evidence indicates that highly dollarized economies do not generally exhibit systematic peso premia at the level of deposit rates, peso lending rates are usually higher than dollar lending rates, reflecting higher peso banking spreads (Barajas and Morales, 2003). To the extent that these margins reflect higher credit risk (higher provisioning costs), this could be interpreted as evidence in support of the credit risk paradigm.[28]

At any rate, MVP explains only a limited share of dollarization in cross-country estimates of FD. Similarly, while there is a clear correlation between FD and pass-through (Honohan and Shi, 2002; de Nicoló, Honohan and Ize, 2003; Reinhart, Rogoff and Savastano, 2003), the elasticity of the pass-through with respect to FD is substantially less than one, confirming the limited share of dollarization explained by the 'observed' MVP. Therefore, ample room remains for additional explanations. Evidence to enable identification of the main driving factors behind this '*excess dollarization*' is scarcer and much less consistent.

The first major candidate is a discrepancy between 'expected' and 'observed' MVPs, reflecting a persistent *lack of monetary credibility and expectations of regime changes*. Indeed, the fact that FD is linked to MVP, when the latter is computed on the basis of a fairly long period, suggests that expected volatilities matter more than recently observed volatilities, reflecting 'peso problems' or slow changes in expectations.[29] The very steep peso yield curves (compared to dollar curves), even in apparently stable macro-environments, lend further support to the lack of credibility theory.

There is also broad evidence that *institutional variables* (legal framework, property rights, governance, etc.) also matter (de Nicoló, Honohan and Ize, 2003; Eichengreen, Hausmann and Panizza, 2003a and 2003b). To the extent that these variables indicate deeper underlying determinants of low institutional credibility, including as regards monetary policy, this could be viewed as further evidence of latent peso problems.[30]

Going beyond MVP

Switching now from MVP-based interior solutions to highly (or fully) dollarized equilibria, the first candidate in support of corner solutions is monetary policy endogeneity. While there is a clear statistical cross-country link *between dollarization and fear of floating* (Levy Yeyati, Sturzenegger and Reggio, 2002; Reinhart, Rogoff and Savastano, 2003) the direction of causality has not been tested and the specific dynamics through which these two variables interact need to better identified.[31] Indeed, they could also be a simultaneous consequence (causally unrelated) of deeper structural weaknesses.

In addition to policy endogeneity, the other key monetary policy feature that could explain the dollar's dominance is policy asymmetry. Early tests to check whether an asymmetric (skewed towards fat upper tails) distribution of the nominal exchange rate can explain dollarization are encouraging but more testing is clearly needed.[32]

Setting aside monetary policy, the dominance of the dollar can also be explained by safe haven effects or market imperfections (in particular imperfect information). In either case, one should observe *a negative correlation between the exchange rate and output in highly dollarized economies* (in the imperfect information paradigm, the correlation between output and the exchange rate should reflect the correlation between the probability of default and the exchange rate, a key link underlying the preference for the dollar). Several empirical studies, including Galindo, Panizza and Schiantarelli (2003), de Nicoló, Honohan and Ize (2003) and Levy Yeyati (2006), provide some supporting empirical evidence in this direction.

A more direct, albeit quite fragmentary, piece of evidence pointing in the same direction is that large borrowers (which are more likely to have multiple creditors, hence inducing coordination failures) tend to be more dollarized than small borrowers (peso loans are also generally smaller than dollar loans). An alternative explanation, however, is that peso funding in highly dollarized countries is too narrow to accommodate the needs of large borrowers. There is indeed some evidence that *peso bond markets tend to be less deep than dollar markets* (de la Torre and Schmukler, 2004).

As regards moral hazard and prudential regulations, a recent study (Cowan, Kamil and Izquierdo, 2004) corroborates the positive impact of currency-blind prudential regulation on FD (symmetrical deposit insurance for both peso and dollar deposits is correlated with greater FD). There is also some specific country evidence in support of the moral hazard view of *liquidity risk*. Restricting or eliminating LOLR induces banks to hold more liquidity (Gonzalez-Eiras, 2003).[33] There has been thus far no study of whether more highly capitalized banks are more reluctant

to engage in dollar intermediation. The reluctance of banks to re-intermediate in the wake of regional currency turmoil, and the recent efforts made in some countries by some of the most conservative banks (but not by the weaker banks) to develop alternatives to the dollar and hold their liquidity in safer but lower-yielding foreign assets (rather than higher-yield domestic assets) could also be consistent with moral hazard. However, the evidence is still quite limited.

3.4 How concerned should countries be?

Monetary policy effectiveness

One early strand of the dollarization literature, inspired by currency substitution models, viewed dollarization as a potential problem for monetary policy effectiveness, based on the fact that monetary aggregates become more sensitive to changes in devaluation expectations. A more recent view emphasizes the higher pass-through and a weaker monetary transmission. The latter in turn derives from the fact that dollar rates and dollar inflows (which affect most savings and credit in a highly dollarized economy) are out of the control of the monetary authority. Moreover, domestic interest rates, through their impact on the exchange rate, may affect the net worth of dollar-indebted borrowers in a way that neutralizes much of their impact. In any event, the view that 'dollarization poses a challenge to the pursuit of a coherent and independent monetary policy' (Baliño, Bennett and Borensztein, 1999) has not lost ground among policy-makers.

Are these concerns verified by the data? On the one hand, FD has not been a significant impediment in *stabilizing inflation* (Reinhart, Rogoff and Savastano, 2003). Using the exchange rate as a flexible anchor has proved successful. Indeed, it is well known that FD has remained at high levels *despite* the sharp decline in inflation in dollarized countries.

However, as already noted, dollarization is associated with higher exchange rate pass-throughs, which may limit, at least in principle, the flexibility of monetary policy and its countercyclical capacity.[34] Indeed, such concerns seem to be an important enduring determinant of fear of floating in highly dollarized environments.[35]

Finally, *as regards transmission capacity*, the effectiveness of the interest rate channel is diluted when most intermediation is in dollars. Dollar loans can expand freely as a result of dollar inflows and increases in domestic interest rates may have little effect on the perceived cost of dollar loans.[36] However, monetary policy may still operate through the exchange rate, by using the rate of crawl as a countercyclical instrument. Such a framework is not without problems (an increase in the rate of crawl aimed at activating the economy increases borrowing costs during the transition), but it appears to be working reasonably well in some cases. However, as in the case of floating rates, large exchange rate movements can have severe adverse impacts on firms' balance sheets.

Balance sheet effects

Indeed, the debate on the drawbacks of dollarization has revolved in recent years around the prudential issues relating to the so-called *balance sheet effect,* when the

increase in the local currency value of dollar liabilities outpaces the increase in the value of the borrower's assets or income flow. To the extent that dollar debtors may no longer be able to service their loans, this can trigger corporate and banking crises (even if banks' currency positions are balanced by regulation), exacerbate sudden stops, cause output volatility and ultimately result in costly self-fulfilling macroeconomic crises.[37] Yet, should devaluations be resisted, financial stress can also result from prolonged economic contractions caused by unadjusted real exchange rate overvaluations. On the deposit side, dollarization enhances the scope for systemic, self-fulfilling, liquidity crises, triggered by persistent deposit withdrawals that can at some point no longer be accommodated, due to limited holdings of liquid foreign assets.

These concerns seem to be empirically justified. Despite some dissenting views,[38] there is fairly good evidence suggesting that FD is indeed associated with a greater financial crisis propensity (including self-fulfilling runs on dollar liquidity), a limited use of exchange rate flexibility and, as a result, a greater output volatility. Dollarized countries: (i) have more fragile corporate sectors (Claessens and Djankov, 2000) and banking systems (de Nicoló, Honohan and Ize, 2003);[39] (ii) are more exposed to contractionary devaluations (Galindo, Panizza and Schiantarelli, 2003), devastating sudden stops (Calvo, Izquierdo and Mejia, 2004), public debt crises (Calvo, Izquierdo and Talvi, 2002) and banking crises (Levy Yeyati, 2006);[40] and (iii) exhibit more output volatility (Reinhart, Rogoff and Savastano, 2003; Eichengreen, Hausmann and Panizza, 2003a; Levy Yeyati, 2006). In turn, the contractionary impact of real exchange rate depreciations (including through banking crises) limits the effectiveness of countercyclical monetary policy under large shocks.

3.5 What can be done?

While the evidence discussed above allows us to make a case for a proactive de-dollarization agenda, there is no precise blueprint to be followed by a prospective de-dollarizer. Indeed, the very feasibility of such an agenda remains controversial and needs to be viewed within a broad macroeconomic and institutional context. In countries where macroeconomic policies and/or the institutional framework are weak, de-dollarizing may amount to a rather futile attempt to deal with the fever without taking care of the sickness. Instead, de-dollarizing seems to make the most sense in those countries where dollarization persists notwithstanding sound monetary and fiscal policies and an improving (if not perfect) institutional framework. In such cases, overcoming dollarization hysteresis may be possible if done through a sufficiently broad and far-reaching policy agenda.

The market-driven road to de-dollarization

An active, market-driven de-dollarization policy agenda should cover at least two fronts:

(i) regulation should be revised so as to fully internalize the risks of dollar intermediation and provide more room for monetary policy; and (ii) the use of the peso

(and peso-based substitutes to the dollar) should be promoted.[41] The case for such a policy rests on the following premise: 'good', market-friendly de-dollarization policies should conquer the fear of floating, mitigate dollarization biases and promote local currency and hedging markets. If all goes according to plan, dollarization should decline in response to good policies, in turn generating further room for policy changes. Such a 'virtuous policy circle' should gradually undo what happened under the previous vicious circle of rising dollarization-cum-fear of floating.

However, cases of market-based de-dollarization are still few and far between (Reinhart, Rogoff and Savastano, 2003; Galindo and Leiderman, 2005).[42] This might in part be because the chances of success of such an approach hinge to a large extent on whether there is dollarization hysteresis. In turn, this depends on whether FD gravitates around MVP (*an interior solution*) or exceeds MVP, possibly to the point of being a *corner solution* (the former being more likely in moderately dollarized economies, the latter in highly dollarized economies).

When FD approximates MVP, *de-dollarizing is equivalent to improving monetary credibility*. Unless FD has already declined to its equilibrium structural level (reflecting globalization), any improvement in credibility should contribute to lower dollarization. Policy reform should thus concentrate on institutional and capacity building measures that gradually improve the central bank's capacity to conduct an independent and sound monetary policy. This being said, building up credibility can be difficult, as already noted. In particular, switching the monetary regime requires a mandate. Without a crisis that drastically reshuffles the cards, legal reform that strengthens the central bank's independence may not be passed and central banks may have a hard time demonstrating that they are capable of conducting a more independent monetary policy.

When FD exceeds MVP, exiting bad dollarized equilibria is likely to be more difficult, since the causes and consequences of FD tend to reinforce each other. In the imperfect information, multiple creditor paradigm, improving transparency might work at the margin. But as long as default and devaluation remain highly correlated in an economy that is already highly dollarized, the dollar's edge over the peso is unlikely to vanish altogether. Unless it creates sufficient incentives for coordination, based on improved information, even a credible switch to a free float-inflation targeting regime (which makes dollar lending more risky relative to peso lending) will not eliminate that correlation and will fail.

In the perfect information paradigm, things are less bleak. A decisive switch in monetary regime should do the trick. Yet, without the ability to precommit, the central bank may be unable to deliver. The announcement of a switch to a float may not be credible and pesos may continue to be perceived as more risky than dollars. If so, dollarization is unlikely to change, continuing to subject the monetary authorities to fear of floating induced by concerns for the financial stability implications of exchange rate volatility.

Prudential reform (tightening prudential norms on dollar loans to the non-tradable sector) may help at the margin to increase the resilience of the banking system to currency risk, thereby providing more room for exchange rate flexibility.

Yet, the main objective of prudential regulation should be to enhance the immediate stability of the financial system, rather than affecting dollarization. Since banks are lending in the least risky currency, given the current monetary regime, changing prudential norms to reflect an alternative assessment of relative risks would be inappropriate unless monetary policy actually changes. Indeed, as long as the monetary regime remains constrained, prudential requirements may need to be raised on peso loans as well as dollar loans.

The resulting excess regulatory burden during the transition towards de-dollarization could induce disintermediation or shifts to alternative (and perhaps more risky) forms of intermediation.[43] Moreover, if these forms of intermediation (such as offshore loans) remain dollar-based, dollarization may not substantially decline and monetary policy reform may stall. Ultimately, unless the authorities' regulation is designed to eliminate this regulatory arbitrage, the attempt to exit high dollarization may fail.

If the aim is to de-dollarize, policy-makers should thus focus on alternative measures to promote the peso and encourage the use of peso-denominated instruments. These may include: (i) improvements in monetary and public debt management that stabilize peso interest rates and promote the development of a peso yield curve;[44] and (ii) a refocusing of public debt management towards peso-denominated instruments (to help deepen the local currency markets).

In this context, price indexation is often proposed as a better alternative to the dollar than the peso, particularly for the longer maturities.[45] This can provide a *bridge* (midway station) towards pesification by facilitating the initial switch out of the high dollar equilibrium. As long as monetary credibility remains low, switching from dollars to price-indexed instruments will be easier than from dollars to pesos. Converting a nominal (peso) rate into a real rate eliminates the component of the peso premium that reflects inflationary expectations (a component that is expected to dominate at longer maturities). Once the economy is real peso-based, the greater exchange rate flexibility (which reduces output risk and interest rate volatility in pesos) may in turn facilitate a second-stage switch to nominal instruments.

However, the value of indexed pesos tends to *fall* (reflecting the backward-looking indexation) in the event of a currency adjustment, whereas that of the dollar rises. Moreover, the liquidity of price-indexed instruments at times of crises (and agents' capacity to move in and out of them) is likely to be limited, particularly in incipient markets. In addition, broad acceptance in the market place of price-indexed instruments takes time and substantial supporting efforts, including as regards public debt management policy (Herrera and Valdes, 2004).

Thus, while indexed pesos should help (particularly in terms of providing an alternative to the dollar for long-dated instruments such as mortgages), they are unlikely by themselves to induce a spontaneous switch out of the dollar, unless their introduction is accompanied by a radical monetary policy switch towards a free float and by an active regulatory policy that makes them more appealing, including the development of peso bond markets that facilitate the pricing and trading of peso

instruments.[46] But if these conditions are in place, the introduction and promotion of price indexation could be viewed as an unnecessary and costly detour.

Should countries fight dollarization through a frontal assault?

Is the market-driven approach the only way? Should countries, instead, fight dollarization frontally? There is no consensus on this question. Measures to directly discourage dollarization (limits on dollar deposits or loans, taxes on dollar intermediation, forced conversion, etc.) could speed things up (and hence reduce transition costs) by cutting through the policy coordination maze. However, conventional wisdom would argue that overnight (de jure) de-dollarization may be risky and ultimately costly, unless up-front measures can be taken simultaneously (or preferably ahead of time) to *boost credibility*. Forcing agents to use a currency that they distrust could lead to heavy disintermediation or risk shifting (de la Torre and Schmukler, 2004). In turn, the costs resulting from disintermediation are likely to undermine the political support for a frontal assault on dollarization in the absence of a crisis. Attempting to mobilize (and maintain) political support for this approach by scaring away the public could backfire if it leads to a run on deposits. Thus, the central bank may be forced to remove restrictions on dollarization and the economy will quickly *re-dollarize with a vengeance*, as happened in Bolivia and Peru during the 1980s (Savastano, 1992).

However, the evidence of this is more mixed than often thought.[47] The forceful de-dollarization in Mexico in 1982 resulted for a long while in the shift of dollar intermediation offshore, through capital flight and external borrowing by large corporations. Nonetheless, it may have helped set the stage for the recent comeback of the peso in the wake of strong improvements in monetary policy credibility. Similarly, the restrictions on dollar intermediation imposed after compulsory conversions in Pakistan and Argentina, while still too recent to judge, may ultimately facilitate the growth of a more healthy and ultimately deeper local currency-based intermediation. Indeed, the view of dollar advocates, that dollarization contributes to financial deepening, is contradicted by the evidence: if anything the link is negative, and the effect of legal restrictions beneficial (de Nicoló, Honohan and Ize, 2003; Levy Yeyati, 2006).[48]

Thus, while a gradual approach that only aims at putting some 'sand in the wheels' of dollarization would be less risky, the question arises of whether the meagre results are worth the trouble. In reality, the slow pace of reform and the possibility of policy interruptions or reversals along the way raise the question as to whether a more forceful approach (supported by a stronger policy commitment) is desirable, at least in the case of very highly dollarized countries.

When there exists a clear consensus and backing for a drastic policy shift, a frontal assault on dollarization in a highly dollarized economy may be possible. While the ideal sequence would entail enhancing the credibility of monetary policy prior to taking drastic measures to switch out of dollarization, in practice a crisis may be needed to help generate such support and provide the basis for a drastic policy change – although in that case the lack of monetary credibility may be

a problem as the central bank may have to make a sudden policy U-turn without having established much of a reputation.

When is it time not to proceed with de-dollarization?

For some countries that are heavily dollarized and small (with narrow markets and large tradable sectors) and whose central banks have low credibility and/or limited technical resources, a radical policy reform may be too costly to entertain. Moreover, countries that have adopted policies that are designed to ease the pain of dollarization and have learned to live with it, may have (unwillingly) undermined political support for a regime change. If so, they may ultimately find dollarization to be irremovable. In such cases, the issue is whether a bi-currency regime, based on very high de facto dollarization, can provide a preferable alternative to full de jure dollarization.

As a currency board, a bi-currency system allows central banks to retain seignorage benefits. The main additional benefit of a bi-currency system is that it provides room (through altering the rate of crawl) for speeding up required adjustments in the real exchange rate, thereby limiting output volatility and the associated financial stress. Provided inflation is kept low, there seems to exist both theoretical and empirical support suggesting that this approach can work (real exchange rates can be depreciated without inducing substantial inflation). Yet, with continued dollarization, risks of financial stress will continue to exist. Hence, limiting financial vulnerabilities will require setting up adequate prudential buffers (solvency and liquidity), which come at a cost.

De jure dollarization also requires some buffers. However, it has the advantage of limiting the scope for 'forced' devaluations resulting from self-fulfilling twin crises (a banking crisis culminating in a currency crisis/devaluation). Hence, it is preferable when the welfare costs and heightened financial vulnerability resulting from increased output volatility and financial exposure to output shocks are more than offset by the reduced exposure to self-fulfilling liquidity crises (and the resulting reduction in interest rates).

This might be the case for countries that seem to be part of an optimal US dollar currency zone or have reached the end of the rope in terms of monetary policy credibility and/or financial instability. Other countries are likely to be better off with a bi-currency regime, at least until the 'chips fall' and clearer (dollar or regional) currency areas emerge.

3.6 Conclusions

A number of preliminary conclusions can be extracted from this survey. First, dollarization can no longer be systematically viewed as an unavoidable and largely inconsequential phenomenon. Instead, the time has come for countries to take a harder look at dollarization and formulate a comprehensive and well-coordinated policy agenda to deal with dollarization and its risks. Second, the policy agenda should be a function of the type and extent of dollarization, as well as the macroeconomic, institutional and structural constraints facing the economy. The latter

will define whether de-dollarizing is an option (and, if so, how best it can be achieved) or whether the policy agenda should limit itself to containing the risks resulting from dollarization without overtly seeking to reduce dollarization itself.

Moreover, dollarization is not all bad. In fact, some dollarization may be desirable. Indeed, countries in which dollarization is non-existent due to legal restrictions and which have credible monetary policies may consider, for efficiency reasons, liberalizing dollar accounts under a suitable prudential environment.

Those countries where dollarization is allowed but on a limited scale and is relatively stable only need to ensure that prudential norms and practices adequately internalize the credit risk of dollar loans. By contrast, countries where dollarization is substantial should consider a proactive de-dollarization strategy as a policy option. When FD is consistent with the 'warranted' MVP dollarization, this strategy should focus on, in addition to internalizing risks and promoting local currency markets, building up monetary credibility through institutional reforms and capacity building.

Countries that remain very highly dollarized notwithstanding substantial progress towards inflation stabilization are likely to be in a 'corner' equilibrium where dollarization is above MVP. In such cases, whenever possible, the preferred strategy is to switch towards a more symmetrical and less constrained monetary policy (such as an inflation-targeting regime), supported by a tightening of prudential standards designed to make the financial system more resilient to exchange rate volatility. The use of more aggressive measures that directly limit dollarization might also be appropriate to help conquer the fear of floating and speed up the transition (thereby limiting its costs), but only as a complement to the monetary reforms described above, rather than as a substitute. Less intrusive, market-based measures, such as the promotion of price-indexed instruments can also help speed up the transition and smooth out its costs. Such measures are particularly advisable for countries where consolidating monetary credibility is expected to be a slow process.

In highly dollarized countries where no substantial progress can be made towards enhancing the credibility of monetary policy but that benefit from maintaining a bi-currency regime, a case may be built for the alternative of learning to live with FD. This entails, inter alia, building up sufficient prudential buffers to ensure that the exchange rate flexibility can be utilized without causing excessive financial stress. However, the cost of such buffers needs to be weighed against the potential benefits of greater exchange rate flexibility. Countries that are small, very open and clearly part of an optimal US dollar currency zone or those with little scope for improving monetary credibility and financial stability, may be better off switching to de jure dollarization.

Needless to say, before embarking on an overly ambitious policy agenda, dollarized countries should make all the necessary research efforts to understand fully the roots of their dollarization, its risks and costs (hence the benefits of de-dollarizing as well as fully dollarizing) and the implications of policy reforms (including, in particular, the calibration of prudential reforms). Understanding the complexity of the phenomenon and its important economic implications is a natural first step.

Notes

1. The authors would like to thank Adrían Armas, Roberto Chang and the participants at the April 2005 Lima conference for their comments.
2. However, there are some important points of intersection between external and domestic FD (including the fact that holders of external dollar assets are typically unknown) and between asset and currency substitution (including the fact that interest-bearing assets also provide liquidity services) that cannot be ignored.
3. Note that the sources of risk are not the expected inflation and devaluation rates, as they should be perfectly incorporated in the interest rate in each currency, but unexpected changes to these rates.
4. The intuition is clear: in a world of perfect pass-through, the real (peso-dollar) exchange rate is constant and dollar real returns are risk-free. By contrast, a volatile exchange rate undermines the attractiveness of dollar instruments relative to pesos, if there is no pass-through.
5. The dollar and peso are used throughout as markets for a more stable and a more volatile currency, respectively.
6. This point, originally made by Thomas (1985) and discussed in more detail in Levy Yeyati (2004), may help explain why dollarization ratios are particularly high in international markets. See below.
7. Note that the same is true for the borrower to the extent that the CPI is closely correlated with the price of the firm's output.
8. More generally, the expected inflation response to sharp negative exchange rate shocks qualifies the results based on data for tranquil times; hence the need to estimate the MVP based on long, representative samples.
9. This assumes that borrowers are less risk averse than creditors. With similar risk aversion, safe haven effects cancel out in equilibrium and only relative volatilities matter. On the other hand, if borrowers are not risk averse and creditors are also the owners of the firms, only safe haven effects matter.
10. The fact that devaluations tend to be contractionary in highly dollarized environments, reflecting balance sheet effects, reinforces this effect in already dollarized countries.
11. This result is reminiscent of earlier findings in the context of public debt markets (Calvo and Guidotti, 1989). With lack of credibility, the very high nominal rates of peso bonds force the government to inflate so as to reduce ex post costs, thereby validating expectations. Dollar- (or inflation-) indexed debt is therefore more attractive than peso debt in that it does not induce such adverse monetary policies. The same argument extends to private debt markets, but the trigger for relaxing monetary policy is a concern for the costs associated with financial stress rather than public debt. If private agents coordinate their actions, private dollarization can also *discipline* monetary policy (Cowan and Do, 2004). Dollarization may thus be thought as a 'good (second best) equilibrium'. However, the argument does not carry through with atomistic lenders and borrowers, where the marginal disciplining effect of dollarizing an individual contract is diluted.
12. As in a non-credible exchange rate anchor, it is the *expectation* of such an asymmetric response that raises the peso premium.
13. Chang and Velasco (2004), obtain a similar conclusion, based on a CCAPM model in a world without credit risk.
14. The term 'corner solution' is used here in a broad sense and is meant to apply to extreme equilibria as well as to true corner solutions.
15. A similar argument can be made at the other end of the risk spectrum. When defaults are induced by overvaluations (e.g., due to price deflation), peso contracts (that carry higher nominal rates) benefit at the expense of dollar claims and the economy fully pesifies. Thus, both full dollarization and full pesification can be equilibrium solutions.

16. By arbitrage, peso lenders should fare better in non-default states. But, from the standpoint of limited liability borrowers that repay only in the latter, this implies a higher effective cost of peso funds and a preference for the dollar. Chamón (2001) and Aghion, Bacchetta and Banerjee (2001b) apply a similar argument to external bonded debt.
17. How the government should respond to this dollarization bias is not obvious. State-contingent contracts (that is, contracts that set interest rates based on the borrower's currency composition of liabilities) would do the trick of modifying market incentives to correct for the risk mispricing. However, emulating this with actual contracts is complicated. The same is valid for creditor coordination.
18. As the value of an option depends positively on the volatility of the underlying asset, the holder of the option maximizes the risk associated with it.
19. Implicit guarantees can be motivated by externalities (e.g., the economic or social costs of bankruptcies) or political economy (e.g., the strength of debtors as an interest group, relative to the taxpayers that ultimately foot the bill).
20. A countercyclical monetary policy that tightens the monetary stance when dollar liquidity becomes scarce has similar effects (Caballero and Krishnamurthy, 2004).
21. This reluctance to acknowledge 'currency difference' can reflect deliberate attempts to adopt dollar-friendly policies in the belief that FD promotes financial intermediation, or to erase any currency distinction to enhance the credibility of the peg, as in the limiting case of a currency board (de la Torre, Levy Yeyati and Schmukler, 2003; Gulde *et al.*, 2004). More generally, the credibility of any exchange rate commitment will be undermined by the threat of a currency collapse that underlies the need for a prudential distinction across currencies. Indeed, FD could be thought of as a deliberate tie-up-your-hands strategy to increase the (financial and real) costs of inflationary policies. In either case, pegs may induce FD indirectly, through a more lenient prudential regulation of dollar operations.
22. While the opening of the domestic banking to more efficient foreign banks may have partly corrected for this imperfection, 'offshorization' may continue to benefit from softer regulation (which induces regulatory arbitrage) and greater opacity (which induces tax evasion). Thin peso markets may also combine with a weak monetary policy to increase the volatility of peso interest rates and the appeal of dollar instruments.
23. This would account for the fact that only a few currencies are customarily used for international issuance, even within the developed country set.
24. This resident-non-resident distinction is in line with the evidence that debt de-dollarization has been driven by the deepening of domestic intermediation (Bordo, Meissner and Redish, 2002) and is correlated with the negative link between external dollarization and the size of domestic financial markets (Claessens, Klingebiel and Schmukler, 2003; Eichengreen, Hausmann and Panizza, 2003a).
25. Size, however, may be proxying market liquidity, which plays a much more important role for securities markets than for bank deposits; hence, the different results.
26. Reinhart, Rogoff and Savastano (2003) show that countries with high dollarization exhibit higher inflation rates, but no empirical testing is conducted and no additional control is used. Indeed, both de Nicoló, Honohan and Ize (2003) and Levy Yeyati (2006) show that, *in the absence of other controls*, inflation is significantly correlated with FD, possibly due to an omitted variable problem.
27. Volatility-based explanations are consistent with a portfolio view as much as with a credit risk view (higher volatility being associated with higher credit risk).
28. If peso funding costs are not higher than dollar funding costs, the higher risk of peso loans would need to be explained by higher interest rate volatility.
29. Morales (2003) finds, for example, in the case of Bolivia that while an MVP measured on the basis of data that includes the hyperinflation period explains well current dollarization levels, more recent data (using the last 10 years) does not. The dynamic estimates of FD

provided by Rennhack and Nozaki (Chapter 4 of this volume) confirm this substantial inertia.

30. In this case, however, the results should be taken with a grain of salt. On the one hand, they face important endogeneity problems, as institutional variables are often available only for recent periods and are highly correlated (and often displaced) by general development controls such as per capita GDP (Levy Yeyati, 2006). Moreover, the fact that most of these variables are highly correlated among each other complicates the identification of the precise institutional trait that plays a relevant role.
31. The estimates provided by Rennhack and Nozaki (Chapter 4 of this volume) make some headway in this direction but fall short of full simultaneous estimation.
32. See Rennhack and Nozaki (Chapter 4 of this volume).
33. A recent paper (Aspachs, Nier and Tiesset, 2005) finds that in the case of UK resident banks, the greater the potential support from the central bank in the case of liquidity crises, the lower the liquidity buffer banks hold.
34. Pass-throughs seem to have declined *pari passu* with inflation in dollarized economies, as in other economies. Moreover, there is some evidence of substantially lower pass-throughs during recessions, due to balance sheet effects and the countervailing effect of depressed demand (Carranza, Galdón-Sánchez and Gomez-Biscarri, 2004).
35. Notice, however, that the link between dollarization and the pass-through is neither simple nor unidirectional. In the porfolio model, dollarization is a reflection of the pass-through, which, in turn, is a reflection of (the lack of) monetary credibility.
36. This should not matter if perfect UIRP applies, borrowers set their prices in local currency (the pass-through is moderate) and the exchange rate floats freely. Under such conditions, when the peso rate is increased, the cost of a dollar loan should increase *pari passu* with that of a peso loan, reflecting a jump appreciation followed by an expected exchange rate depreciation. However, the conditions above, particularly UIRP, are unlikely to be met in most cases.
37. The vast analytical literature on the subject include Krugman (1999); Chang and Velasco (2000); Aghion, Bacchetta and Banerjee (2001a and 2001b); Gertler, Gilchrist and Natalucci (2001); Cespedes, Chang and Velasco (2000); Caballero and Krishnamurthy (2002); Jeanne and Zettelmeyer (2002); and Calvo *et al.* (2003). See also Frankel (2004) for a survey of the different arguments on contractionary devaluations.
38. The case for balance sheet induced contractionary devaluations at the micro level is still not entirely clear (Bleakley and Cowan, 2002), possibly due to the fact that they have been largely prevented by (widely anticipated) government bail-outs.
39. Corporates' exposure to large currency fluctuations is worsened by the fact that hedging markets are typically underdeveloped in highly dollarized environments, reflecting the heavily administered exchange rate management.
40. This evidence is in line with Domac and Martínez Pería (2006), and contradicts Arteta (2003), who finds that FD does not increase crisis propensity – albeit for a much smaller sample. See also de Brun and Licandro (Chapter 7, this volume) for a detailed and illustrative tale of the perils of dollarization, as experienced recently by Uruguay.
41. See Levy Yeyati (2006) and Gulde *et al.* (2004) for a detailed discussion along these lines.
42. Recent reductions in FD in some highly dollarized Southern American countries, following more aggressive and better focused monetary policies, are also worth noting and encouraging. However, it is still too early to say how far those trends will extend.
43. Risk shifting could include a shift towards shorter-term peso liabilities, thereby increasing banks' exposure to liquidity risk (de la Torre and Schmukler, 2004).
44. This is the route followed by the Central Bank of Peru in recent years. See Armas and Grippa, Chapter 6 of this volume.
45. See Holland and Mulder, Chapter 10 of this volume.

46. The use of price-indexed instruments can also be encouraged by currency-specific prudential norms that reflect their lower risk relative to dollar or local currency fixed-rate instruments. See Cayazzo *et al.*, Chapter 8 of this volume.
47. See Hardy and Pazarbasioglu, Chapter 11 of this volume.
48. See also Cowan, Kamil and Izquierdo (2004).

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Comments on Chapter 3

Roberto Chang

One consequence of the sequence of emerging markets crises that started with the Mexican devaluation of 1994 is a widespread recognition of a need to revise exchange rate theory to take into account the role of financial institutions and frictions. Topics such as financial dollarization, balance sheet effects, contractionary devaluations and the like are no longer exotic side trips but have become central to the formulation of monetary and exchange rate policy. There is a lot of related research going on.

But while it is clear that we have travelled a long way, I am not sure where we are getting to. Our models have improved by allowing for currency mismatches, endogenous risk premia and so on, but this progress has been obtained only under ad hoc assumptions on the currency denomination of assets and liabilities. As a consequence, any implications, especially for policy, are suspect and indeed may not be robust, as stressed by Olivier Jeanne, Marcos Chamón and others.

The obvious response is that research efforts should be aimed at understanding the basic determinants of financial phenomena such as dollarization, from first principles if possible. The chapters in this section are good contributions to this agenda.

As requested by the editors, my comments focus on Chapter 3 by Alain Ize and Eduardo Levy Yeyati, which surveys the state of the art on the growing literature on financial dollarization, and attempts to identify useful directions for further research. The chapter reviews some theories of financial dollarization, related empirical work, why financial dollarization is a 'problem', and policy issues related to de-dollarizing.

The chapter starts with the crucial question of how to explain observed degrees of financial dollarization, and basically finds three kinds of answers in the literature:

Risk sharing: If financial markets are incomplete, financial instruments denominated in different currencies have implications for allocating risks to borrowers and lenders. Then the degree of financial dollarization is typically determined by a CAPM model or similar.

Market failures: Financial dollarization may be seen as an endogenous response of an economy to the time inconsistency of government policy, asymmetric information, or imperfect bankruptcy procedures.

Relative country size: Financial dollarization may express an economy's attempt to exploit economies of scale in financial intermediation.

Distinguishing between these hypotheses is clearly important, in particular, for the formulation of appropriate policy. For instance, if financial dollarization reflects risk sharing there is little presumption that government intervention can improve upon the market outcome. On the other hand, public policy may be able to help if dollarization reflects an underlying market failure.

Accordingly, Chapter 3 turns to empirical studies of financial dollarization. Unfortunately, the authors find that existing work is sketchy at best, and more of a collection of interesting stylized facts than a body of systematic evidence. This state of affairs is due, to a large extent, to the lack of adequate data for exploring new models of financial dollarization. The insufficiency of the data may itself be endogenous, as only recently we have started looking for empirical measures of currency mismatches and the like.

A more significant concern, I believe, is that the interpretation of even the few available studies is unclear. Significant identification problems remain and prevent us from drawing conclusions for discriminating between the alternative theoretical views of financial dollarization. This turns out to be crucial for policy analysis.

Let me illustrate this point with a specific example. Consider the model of Chang and Velasco (2006), which is cited in Chapter 3. That model features workers that are risk averse and borrow from the world market in dollars, and firms that borrow from workers to finance production of a home good. Because markets are incomplete, workers and firms write debt contracts in pesos and dollars to share risk, and the dollarization ratio is determined as in the consumption CAPM model.

The twist is that, in the model, nominal wages are rigid, and the central bank chooses a policy regime (fixed or flexible exchange rates) after private contracts are written. Therefore, the central bank decision depends, among other things, on the degree of financial dollarization. But debt and wage contracts, in turn, will reflect market expectations of future price and exchange rate variability.

The key result is that there may be two self-fulfilling equilibria. There is always an equilibrium with flexible exchange rates. But there may be also an equilibrium with fixed exchange rates, which displays substantial currency mismatches. The fixed rates equilibrium is Pareto dominated, and hence phenomena associated with it (currency mismatches, financial dollarization and fear of floating) reflect a coordination failure.

What are the lessons for our current discussion? In the model just described, portfolio choice and dollarization ratios satisfy a strict version of the consumption CAPM. Hence, in a world of many economies similar to this one, an empirical researcher would indeed find very good evidence that dollarization is explained by minimum variance portfolios and other variables suggested by the CAPM approach. But also, and by construction, the model exhibits multiple equilibria and implies that government policy may be Pareto improving.

In terms of the categories mentioned earlier, regressions of financial dollarization on minimum variance portfolios may give us little or no information about the

relative merits of the risk sharing versus market failure hypotheses. Of course, here the reason is that those two hypotheses are not inconsistent with each other: CAPM-like theories have implications for individual portfolios, while market failures may be systemic.

Since existing evidence fails to validate a particular theory of financial dollarization, it also fails to identify welfare-improving policy. For example, in the model of Chang and Velasco (2006), multiple equilibria exist because the central bank has a time inconsistency problem. How the central bank can improve its ability to precommit to solve time inconsistency is unclear. On the other hand, Chang and Velasco show that the bad equilibrium can be eliminated by appropriate direct regulation of financial dollarization. This is noteworthy, as the discussion by Ize and Levy Yeyati would imply that direct intervention on portfolios is the wrong choice if financial dollarization is well explained by CAPM considerations.

My conclusion is not that we need to implement direct controls on financial portfolios but that, more generally, we must deal carefully with serious identification issues. CAPM-motivated regressions of financial dollarization are useful to uncover some stylized facts, but we have to dig more deeply before obtaining conclusions useful for policy.

Let me finish with two brief remarks. We seem far from having a widely accepted theory of financial dollarization, and there is no obvious presumption that government policy should be actively aimed at 'de-dollarizing' our economies. That financial dollarization has been so persistent can be used to argue, in fact, that it has not been such a crucial restriction on macroeconomic policy: Peru, having brought annual inflation from 7,000 per cent to almost zero is the obvious example.

This being said, a tight case for de-dollarization remains but has not been mentioned: the ability of the central bank to act as a lender of last resort. One key difference between an economy that has financial instruments primarily denominated in domestic currency and a highly dollarized economy is that the central bank can always, if needed, take over and honour financial obligations in the first economy, because the central bank prints domestic currency at negligible cost. In contrast, the central bank cannot honour obligations in foreign currency unless it maintains a large and costly stock of foreign reserves. This argument was explored in some detail in Chang and Velasco (2000), but perhaps should be added to the list of considerations for further study.

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4

Financial Dollarization in Latin America

Robert Rennhack and Masahiro Nozaki[1]

4.1 Introduction

In the past fifteen to twenty years, many developing countries have experienced a process known as financial dollarization (FD), in which residents hold deposits denominated in foreign currency – the US dollar in many cases.[2] In several countries, this has been accompanied by dollarization of the real sector, with a large share of purchases of goods and services and payment of wages taking place in foreign currency, or by currency substitution, where foreign currency also serves as a means of payment. The process of FD has usually occurred in the aftermath of a severe economic crisis involving high inflation that undermines confidence in the local currency. Moreover, in many of these countries, dollarization remains very high, even though economic performance has improved and inflation has subsided.

Over the past decade, concerns about the effects of FD have increased. FD can help an economy by discouraging capital flight and encouraging residents to keep their savings in the domestic financial system. Yet it also carries potentially significant drawbacks, especially by narrowing the scope for policy manoeuvre during a crisis.[3] If residents maintain significant cash balances in foreign currency, monetary policy may be less effective in managing domestic liquidity to control inflation or to dampen the effects of banking difficulties through lender of last resort financing. More importantly, banks in highly dollarized countries tend to lend in foreign currency to borrowers with little or no foreign exchange earnings. This could weaken balance sheets by creating a significant currency mismatch. Banks could suffer severe losses in the event of a sharp real depreciation, which would drive up the costs of servicing foreign currency debt without necessarily raising the borrowers' income. Governments in highly dollarized countries also face this risk, as they tend to collect revenues in local currency while servicing debts in foreign currency. In this situation, high FD can deepen an economic crisis, such as in the case of Argentina in 2001 and Uruguay in 2002.

For this reason, the policy debate has focused on the causes of FD and the best policies to promote a recovery in the use of local currency for financial transactions and savings. This chapter seeks to test several explanations for FD, with an

emphasis on Latin America – a region that includes countries which have avoided FD as well as those with persistently high FD. And in the past few years several countries in the region – most notably Paraguay and Peru – have been able to reduce the extent of FD. Section 4.2 reviews the empirical trends in FD. Section 4.3 assesses whether FD has been a rational response to inflation uncertainty. Section 4.4 looks at the role of exchange rate policy and currency mismatches in encouraging and perpetuating FD. Section 4.5 reviews the policy implications of the results.

4.2 Trends in financial dollarization

FD increased in most developing country regions between the mid-1990s and early this decade (Table 4.1). The use of foreign currency rose most rapidly in the transition economies, with almost half of all bank deposits denominated in foreign currency by 2001. FD rose in Latin America and Africa, while holding steady in Asia during this period. This trend occurred despite a significant decline in inflation after 1995 in most regions (Table 4.2).

In the early 1990s, Latin America, Africa and the transition economies experienced high inflation on average. Asia experienced a moderate rise in inflation around the

Table 4.1 Dollarization by region, 1995 and 2001

		1995	2001
Transition economies		34.4	47.8
Of which:	Bosnia and Herzegovina	–	62.5
	Bulgaria	29.5	57.2
	Hungary	30.5	20.5
	Poland	27.6	18.9
	Russia	28.5	34.3
	Slovenia	42.1	36.1
	Ukraine	36.8	32.4
Asia		31.0	30.3
Of which:	Indonesia	19.7	20.1
	Korea	0.5	3.5
	Lao People's Democratic Republic	57.3	82.7
	Philippines	24.7	30.7
	Thailand	0.3	1.3
	Vietnam	34.6	43.4
Africa		23.2	31.9
Of which:	Angola	25.4	81.0
	Ghana	25.6	–
	Nigeria	4.1	5.0
	South Africa	0.7	6.2
	Zambia	20.1	42.7
Latin America		39.8	44.3

Source: de Nicoló, Honohan and Ize (2005).

Table 4.2 Average inflation by region (in per cent per year)

	1990–4	1995–9	2000–3
Africa	469.8	127.0	37.6
Asia	7.3	11.2	4.4
Industrialized	4.6	2.1	2.2
Latin America	365.6	14.8	9.3
Transition	873.0	44.1	10.4

Source: International Financial Statistics (IFS).

time of the Asian crisis in 1997–8. However, by the late 1990s, all of these regions had rates of inflation close to industrialized country levels.

Looking more closely at Latin America, FD picked up sharply between 1990 and 2001 (Table 4.3). Foreign currency deposits (FCDs) as a share of total deposits rose significantly in countries that were already highly dollarized, such as Bolivia and Uruguay. Dollarization also increased in countries with lower levels of dollarization in 1990, such as Costa Rica, the Dominican Republic and Honduras, Nicaragua and Paraguay. Early this decade, Ecuador and El Salvador opted for full, official dollarization, each under very different circumstances. Five countries in Latin America – Brazil, Chile, Colombia, Mexico and Venezuela – have avoided significant dollarization, even though they also have experienced severe macroeconomic problems since 1980. These countries preserved the demand for their currencies through a combination of sound economic policies, indexed financial instruments and legal restrictions on dollarized transactions. Except for Venezuela, residents of these countries placed their foreign currency assets abroad, but even in these cases, total foreign exchange deposits (including offshore deposits) were less than in the highly dollarized countries.[4] Moreover, by shifting the FCDs abroad, these countries insulated their domestic banking systems from the risks associated with FD.

Since 2001, FD has declined in some Latin American countries. Argentina forced its residents to convert foreign currency into pesos, thereby reducing its dollarization sharply. Bolivia, Peru and Uruguay have experienced moderate declines in FCDs as a share of total deposits, while FD fell sharply in Paraguay in 2004. Nonetheless, the extent of FD still remains high in many of these countries.

This persistence of FD seems puzzling because most of Latin America made significant gains in macroeconomic stability in this period. Both the rate and volatility of inflation declined significantly since the mid-1990s. Also the real exchange rate became more volatile, compared with the previous fifteen years, which would tend to discourage FD (Table 4.4). The rise in the volatility of the real exchange rate probably results from the adoption of flexible exchange rate regimes in the late 1990s by many Latin American countries. The central government deficit declined as well, while financial systems appear to have deepened. Real economic growth has remained steady at 2.5 per cent a year on average, while real lending interest rates have become positive in real terms.

Table 4.3 Selected Latin American countries: deposit and loan dollarization

	Foreign currency-denominated deposits (in per cent of total deposits)					Foreign currency-denominated loans (in per cent of total loans)			
	1990	2001	2002	2003	2004	2001	2002	2003	2004
Argentina	47.2	71.5	4.2	6.7	10.7	80.0	7.2	7.1	14.1
Bolivia	80.7	91.5	90.8	90.0	85.3	97.0	97.3	97.7	97.7
Brazil	0.0	6.1	6.5	–	6.5	18.0	19.4	–	12.0
Chile	16.3	14.0	12.8	13.2	11.9	13.8	13.0	10.3	10.3
Colombia	0.3	0.5	0.4	0.0	2.0	11.0	11.6	8.8	6.1
Costa Rica	26.8	49.1	50.0	50.2	56.6	67.2	53.0	55.5	53.3
Dominican Republic[1]	2.2	23.9	26.1	27.5	25.1	27.6	30.9	37.0	27.3
Ecuador	13.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
El Salvador	4.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Guatemala	0.0	5.1	8.8	12.4	14.9	–	15.3	16.7	17.7
Honduras	1.8	33.4	34.2	35.1	35.7	22.2	22.8	26.4	30.9
Mexico	10.1	8.1	4.6	4.5	5.4	20.5	12.9	12.3	9.8
Nicaragua	40.3	70.6	72.1	69.6	68.7	83.6	83.1	84.3	85.0
Paraguay[1]	33.9	66.6	68.7	63.0	47.0	52.8	58.2	55.7	51.7
Peru	62.5	74.3	73.2	70.6	64.1	80.5	79.7	77.9	75.9
Uruguay[2]	88.6	83.0	90.0	93.0	83.0	66.0	81.0	76.0	70.0
Venezuela	–	0.2	0.2	0.2	0.1	0.7	0.8	0.7	0.6

Sources: Central banks; and IMF staff estimates.
1. For the Dominican Republic and Paraguay, 1990 column refers to 1996 data.
2. Loan ratio for Uruguay includes only lending to residents.

Table 4.4 Indicators of macroeconomic stability, 1980–2003 (in annual per cent change, unless specified otherwise)

	1980–95				1996–2003			
	Latin America[1]		Outside Latin America		Latin America		Outside Latin America	
	Mean	Volatility[2]	Mean	Volatility[2]	Mean	Volatility[2]	Mean	Volatility[2]
Nominal stability								
M2	216.3	4.0	75.5	4.4	15.4	1.0	30.2	5.0
CPI	244.8	4.4	89.6	9.4	11.2	1.3	21.0	8.1
Nominal exchange rate	234.7	4.8	84.2	17.2	14.2	1.9	43.1	10.9
Lending interest rate	81.1	4.7	27.4	3.1	29.2	0.6	20.4	1.1
Government deficit (in per cent of GDP)	−3.9	1.2	−4.7	1.9	−3.0	0.9	−3.3	1.7
M2 (in per cent of GDP)	29.6	0.5	52.8	0.9	33.9	0.4	51.2	0.9
Real stability								
Real GDP	2.5	1.8	2.1	3.5	2.5	1.4	3.8	1.2
Real exchange rate	5.3	10.4	−0.2	85.0	−0.3	36.3	1.1	11.5
Real lending interest rate	−147.0	8.2	−4.8	38.1	19.7	1.1	8.2	4.3
Exports (in per cent of GDP)	22.2	0.4	43.2	1.3	27.5	0.4	43.4	0.6

Sources: IFS and IMF, *World Economic Outlook* (WEO).
1. Excludes Argentina in 1989 and Nicaragua in 1988.
2. Coefficient of variation.

The persistence of dollarization through 2001 could reflect a historical legacy. Inflation in many Latin American countries during the period 1980–95 was extremely high by historical standards and compared with other developing country regions. In the period 1980–2003, there were a total of 56 so-called free-fall events – defined as years when broad money or consumer prices rose or the currency depreciated by over 1,000 per cent or when deposit or lending interest rates exceeded 100 per cent (Table 4.5). Three quarters of these events occurred in six Latin American countries (Argentina, Bolivia, Brazil, Nicaragua, Peru and Uruguay).

Table 4.5 Summary of free-fall events, 1980–2003[1]

Country	Year	M2 (per cent change)	CPI (per cent change)	Exchange rate[2] (per cent change)	Deposit interest rate (per cent)	Loan interest rate (per cent)
Angola	1993	657.2	1379.4	958.1	–	–
Angola	1994	3304.9	948.8	2137.3	–	–
Angola	1995	475.9	2671.8	4521.1	125.9	206.3
Angola	1996	3804.6	4145.1	4555.2	147.1	217.9
Angola	2000	303.7	325.0	372.7	39.6	103.2
Argentina	1981	118.3	104.5	139.6	157.1	–
Argentina	1982	131.5	164.8	488.8	126.2	–
Argentina	1983	403.0	343.8	306.2	281.3	–
Argentina	1984	603.7	626.7	542.4	396.8	–
Argentina	1985	435.0	672.2	789.6	630.0	–
Argentina	1987	163.7	131.3	127.4	175.9	–
Argentina	1988	441.5	343.0	308.2	371.8	–
Argentina	1989	2283.2	3079.8	4736.7	17235.8	–
Argentina	1990	1059.4	2314.0	1051.8	1517.9	–
Bolivia	1984	1421.1	1281.4	1253.8	108.3	120.7
Bolivia	1985	7035.3	11749.6	13943.2	68.8	172.2
Brazil	1980	–	–	–	115.0	–
Brazil	1981	88.1	101.7	76.7	108.0	–
Brazil	1982	84.0	100.5	92.8	156.1	–
Brazil	1983	135.8	135.0	221.4	154.6	–
Brazil	1984	270.1	192.1	220.3	267.6	–
Brazil	1985	322.5	226.0	235.5	295.4	–
Brazil	1986	289.2	147.1	120.2	109.5	–
Brazil	1987	213.7	228.3	187.3	401.0	–
Brazil	1988	1511.9	629.1	568.9	859.4	–
Brazil	1989	1461.9	1430.7	980.5	5845.0	–
Brazil	1990	1147.5	2947.7	2310.1	9394.3	–
Brazil	1991	705.3	432.8	495.3	913.5	–
Brazil	1992	1651.7	951.6	1009.9	1560.2	–
Brazil	1993	2979.8	1928.0	1859.9	3293.5	–
Brazil	1994	1035.7	2075.9	1887.7	5175.2	–
Bulgaria	1996	124.5	–	164.8	74.7	123.5

Continued

Table 4.5 Continued

Country	Year	M2 (per cent change)	CPI (per cent change)	Exchange rate[2] (per cent change)	Deposit interest rate (per cent)	Loan interest rate (per cent)
Israel	1980	–	131.0	–	–	176.9
Israel	1981	829.3	116.8	123.1	–	170.6
Israel	1982	141.8	120.4	112.3	–	140.2
Israel	1983	206.9	145.6	131.6	132.9	186.2
Israel	1984	510.2	373.8	421.6	438.4	823.0
Israel	1985	168.5	304.7	302.1	178.8	503.4
Nicaragua	1988	12360.0	10205.0	262676.7	107379.1	121906.0
Nicaragua	1989	2746.8	4770.2	5703.7	1585.9	558.0
Nicaragua	1990	8603.8	7485.5	4401.0	9.5	22.0
Nicaragua	1991	1428.4	2945.1	2930.6	11.6	17.9
Peru	1988	624.7	667.0	665.2	161.8	174.3
Peru	1989	2015.0	3398.7	1969.5	1135.6	1515.9
Peru	1990	6311.5	7481.7	6947.0	2439.6	4774.5
Peru	1991	236.1	409.5	311.2	170.5	751.5
Peru	1992	55.5	73.5	61.3	59.7	173.8
Poland	1989	236.0	244.6	234.3	100.0	64.0
Poland	1990	121.9	555.4	560.1	41.7	504.2
Uruguay	1988	87.2	62.2	59.0	67.8	101.5
Uruguay	1989	118.7	80.4	73.3	84.7	127.6
Uruguay	1990	123.0	112.5	88.3	97.8	174.5
Uruguay	1991	78.8	102.0	72.5	75.2	152.9
Uruguay	1992	45.4	68.5	49.9	54.5	117.8
Uruguay	2002	15.8	14.0	59.6	–	126.1
Zambia	1993	101.5	183.3	162.9	–	113.3

Sources: WEO and IFS.

1. Free-fall events are defined as years when any one of the following occurred:
   - Annual percentage change of M2 exceeds 1,000 per cent.
   - Annual percentage change of CPI exceeds 1,000 per cent.
   - Annual percentage change of exchange rate exceeds 1,000 per cent.
   - Deposit interest rate exceeds 100 per cent per annum.
   - Loan interest rate exceeds 100 per cent per annum.
2. National currency units per US dollar.

4.3 Financial dollarization as a rational response to inflation uncertainty

Theoretical overview[5]

Even though inflation may have declined in countries with high FD, doubts may linger about the credibility of monetary policy, and residents resort to FCDs to protect their purchasing power measured in local currency from the risk of a surge in inflation. The yield curves in the six highly dollarized countries at end-2004 suggest that markets still wonder about the future stance of monetary policy (Figure 4.1).

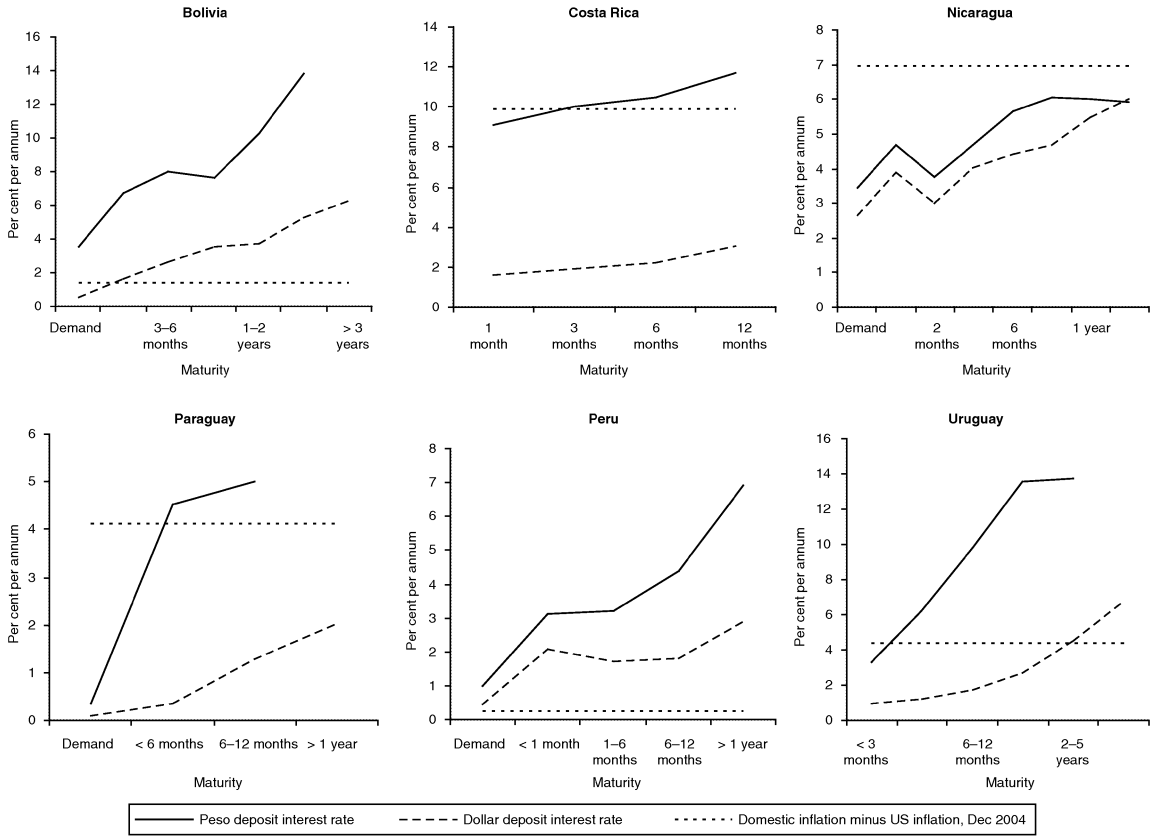

Figure 4.1 Yield curve for deposit interest rates, 2004

Source: Country authorities.

In Bolivia, Paraguay, Peru and Uruguay, the gap between the yield curve for domestic currency deposits and for FCDs widens over time to well in excess of the inflation differential in most of these countries. In Costa Rica, the difference between the yield curves is closer to the inflation differential, yet the differential still widens gradually at longer maturities, suggesting concerns about the future stance of monetary policy.

Ize and Levy Yeyati (2003) emphasize the importance of the relative volatility of inflation for determining the degree of FD. They argue that residents will prefer to hold FCDs if the risk of unexpected inflation is high. Specifically, residents look at the volatility of inflation relative to that of the change in the real exchange rate and hold a larger share of their portfolio in foreign currency assets as inflation becomes relatively more volatile and as the real exchange rate becomes more stable. In this situation, the real value of foreign currency assets – measured in terms of domestic purchasing power – is more stable. Similarly, stable domestic inflation and a volatile real exchange rate will make domestic currency assets a better store of value. This approach assumes that arbitrage tends to equalize the rates of return on domestic and foreign currency assets, which implies that shifts in inflation or interest rates will not affect the decision to hold foreign currency assets. Ize and Levy Yeyati develop a variable that measures the portfolio share allocated to foreign currency assets that minimizes the variance of a portfolio with local currency and foreign currency interest-bearing assets. They show that this share of the MVP raises as domestic inflation becomes more variable relative to the real exchange rate. They present empirical support for their view that a larger MVP contributes to more FD.

Weak institutions undermine the credibility of policies, as residents may fear that governments will erode the value of financial assets by generating unexpected inflation. De la Torre and Schmukler (2004) add that weak institutions can also raise doubts about the enforceability of contracts and encourage residents to shorten the duration of contracts or undertake transactions offshore in countries with more secure legal frameworks. Indicators of the quality of institutions have been developed by the World Bank, with a database starting in 1996 that includes measures of political stability, government effectiveness, regulatory quality, rule of law and control of corruption, and voice and accountability. Other agencies have compiled longer time series on institutional variables, such as political stability, bureaucratic effectiveness and ethnic tensions.

The current macroeconomic situation can also influence the degree of dollarization. Guidotti and Rodríguez (1992) and Uribe (1997) develop models of currency substitution to explain how high inflation lowers demand for domestic currency as a means of payment and unit of account, contributing to dollarization. Their models also show that currency substitution can remain high even when inflation declines. Guidotti and Rodríguez point to costs associated with re-denominating transactions back into domestic currency, while Uribe attributes persistent dollarization to network effects – the cost of using foreign currency declines as more residents rely on this means of payment. In both models the demand for domestic currency will recover if inflation falls by enough to justify incurring the costs of

the transition. While these models were developed to explain currency substitution, the results can also apply to FD, especially in economies where financial innovations allow broader forms of money to also serve as a means of payment. The fiscal deficit can also affect the degree of dollarization. In many dollarized countries, the surge in inflation that cut confidence in the domestic currency arose from a wide fiscal deficit that had to be financed with money creation. For this reason, fiscal discipline might help reduce dollarization by strengthening confidence.

Empirical results

We estimated equations that sought to explain FD in terms of the MVP, inflation, the central government deficit, indices of institutional quality and political stability and legal restrictions on dollarization. The dependent variable is the ratio of FCDs to total deposits, which – while imperfect – provides the most widely available measure of dollarization. We first estimate a cross-section model for a sample of over 62 countries with broad regional coverage that includes OECD countries, transition economies, Asia and Africa, as well as Latin America for the period 1990–2001.

The results of the cross-section equations confirm the results of de Nicoló, Honohan and Ize (2005) and Ize and Levy Yeyati (2003) (Table 4.6). Equation 1 shows that the minimum variance portfolio explains an important part of dollarization, with a 10 per cent increase in the MVP raising deposit dollarization by 5 per cent. Inflation plays an important role as well. In addition, legal restrictions on FCDs appear to be effective in reducing deposit dollarization. The coefficient on the central government deficit – both as a share of GDP and of broad money – is not statistically significant. While surprising, this result could reflect a measurement problem – the central government deficit is the most widely available measure but may not be sufficiently comprehensive. Possibly, the current fiscal position may not reflect lingering uncertainty about future fiscal policy, or institutional changes – such as eliminating central bank financing to the government – may have eased concerns about the risk of monetizing large fiscal imbalances.

In Equations 2 through 5, the coefficients on the indicators of institutional quality are statistically significant and have the correct sign in the full sample, which includes OECD countries.[6] Looking at indicators of institutional quality developed by the World Bank, there is no significant difference between the quality of institutions in Latin America and Asia, Africa, or the transition economies. However, OECD countries clearly have much stronger institutions than developing countries. When OECD countries are excluded from the sample, the coefficients on the institutional variables are no longer statistically significant (equations 6–9). This result could suggest that significant gains in institutional quality are required to bolster confidence and discourage dollarization.

We tested whether FD was higher in countries that experienced so-called free-fall events during the 1980s. Equation 10 includes a dummy variable for those countries, and the results suggest that this factor does not explain differences in FD across countries.

We tried to assess how quickly the MVP, inflation, institutional quality and other factors affect the level of dollarization by estimating these equations using a panel data set with a lagged dependent variable (Table 4.7). These equations were

Table 4.6 Deposit dollarization: results of cross-country regressions[1]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Equation	**Including OECD countries**					**Excluding OECD countries**				**Free-fall**
MVP	0.5	0.46	0.46	0.45	0.44	0.42	0.42	0.41	0.42	0.48
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation	0.034	0.037	0.036	0.037	0.037	0.038	0.037	0.04	0.038	0.035
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Restriction	−5.2	−5.9	−5.3	−5.4	−5.8	−5.8	−5.7	−5.8	−5.7	−4.4
	(0.06)	(0.03)	(0.07)	(0.04)	(0.03)	(0.07)	(0.07)	(0.07)	(0.07)	(0.09)
Government balance	−0.87									
	(0.11)									
Voice and accountability		−4.6				−0.19				
		(0.04)				(0.96)				
Regulatory quality			−5.6				−1.58			
			(0.04)				(0.72)			
Rule of law				−3.7				1.67		
				(0.07)				(0.64)		
Control of corruption					−4.1				0.10	
					(0.03)				(0.98)	
Free-fall (1980s)										0.1
										(0.13)
Constant	9.1	14.3	15.2	14.0	14.2	17.0	17.2	17.3	17.0	10.6
	(0.00)	(0.00)	(0.000)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
No. of observations	62	63	63	63	63	44	44	44	44	63
R-squared	0.66	0.67	0.67	0.62	0.67	0.60	0.60	0.61	0.60	0.66

Sources: Data sources, variable definitions and estimation methodology are presented in Appendices, 4.1 and 4.2.
1. *P* values are presented in parentheses.

Table 4.7 Deposit dollarization: results of panel data regressions[1]

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Equation		**Macro**				**Institutional**		**Latin America**	**Highly dollarized**
D_{t-1}	0.95	0.94	0.96	0.94	0.94	0.94	0.95	0.72	0.77
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MVP_t	0.033	0.035	0.026	0.036	0.027	0.035	0.028	0.078	0.036
	(0.07)	(0.06)	(.105)	(0.1)	(0.06)	(0.06)	(0.07)	(0.01)	(0.02)
Inflation$_t$	0.001								
	(0.08)								
Depreciation$_t$		0.001							
		(0.10)							
Government balance$_{ma(3)}$			0.063						
			(0.56)						
Democratic process				0.388					
				(0.3)					
Bureaucracy					−0.643				
					(0.09)				
Control of corruption						−0.02			
						(0.95)			
Internal conflict							−0.09		
							(0.62)		
Law and order									
D_{t-1} Latin America								0.25	
								(0.00)	
MVP_t Latin Amercia								−0.09	
								(0.01)	

D_{t-1} highly dollarized									0.21
									(0.03)
MVP_t highly dollarized									−0.04
									(0.03)
Constant	1.47	1.5	1.36	−0.12	3.09	1.59	2.19	3.37	3.3
	(0.01)	(0.01)	(.016)	(0.932)	(0.03)	(0.07)	(0.23)	(0.00)	(0.00)
No. of countries	47	47	47	47	47	47	47	47	47
No. of observations	338	338	338	338	338	338	338	338	338
F-statistic	604.6	807.6	1282.9	836.4	1161.1	781.9	1025.4	1300.2	3224.1

Sources: Data sources, variable definitions and estimation methodology are presented in Appendices 4.1 and 4.2.
1. *P* values are presented in parentheses.

estimated using the two-step system generalized method of moments (GMM) method developed by Blundell and Bond (1998).[7] Equation 11 suggests a high degree of persistence to dollarization, as the coefficient on the lagged dollarization ratio is quite high at 0.95. The MVP has a statistically significant effect on dollarization, although relatively small in the near term, as a 10 per cent decline in the MVP would lead to just a 0.3 per cent decline in FD after one year. The longer-term effect is much larger – and similar to the elasticity estimated in the cross-country regressions – with a 10 per cent decline in the MVP leading to a 5 per cent decline in deposit dollarization. Inflation and the nominal rate of depreciation have a statistically significant but small impact on dollarization, while the central government deficit has no significant impact on dollarization (Equations 11–13).[8] Equations 14 through 18 suggest that none of the measures of institutional quality or political stability – apart from the quality of the bureaucracy – have a significant effect on deposit dollarization, possibly reflecting the fact that there is insufficient variation in these variables over time.

There is some evidence that the persistence of FD is higher in Latin America and in highly dollarized countries (with dollarization ratios above 40 per cent). Equation 19 includes an interactive dummy variable for Latin America on the coefficient for the lagged dependent variable and for the MVP. The results indicate that persistence is much lower outside Latin America, as the coefficient on the lagged dependent variable declines to 0.72 for these countries. The coefficient on the MVP is considerably higher for countries outside Latin America. Equation 20 includes a similar interactive dummy variable for the lagged dependent variable and the MVP but this time for highly dollarized countries, and the results show that persistence is higher, and the effect of the MVP is lower, in these countries.

4.4 The role of credit risk

Ize and Powell (2004) and Ize (Chapter 2 of this volume) broaden the explanation of FD to include credit risk arising from a shift in interest rates or exchange rates. They emphasize the role of expected bankruptcy costs – which are often high in many developing countries because of non-transparent accounting and lengthy and at times unreliable judicial proceedings. From the creditors' perspective, the value of claims and collateral in local currency can also be diluted by surprise inflation. These authors show that economies settle into equilibria using the currency or mix of currencies that limit expected bankruptcy costs. Ize (Chapter 2 of this volume) shows that equilibria with high FD are possible with an inflexible and asymmetric exchange rate policy, prudential regulations that encourage moral hazard and strong concerns about financial stress arising from a currency mismatch.[9]

The exchange rate policy of central banks in many developing countries may encourage dollarization by limiting exchange rate flexibility, which reduces the risk of holding foreign currency assets and of lending in foreign currency to all sectors, including non-tradable. For this group of countries and time period, we calculated the Calvo-Reinhart index of fear of floating, which measures the

variability of the rate of depreciation in the nominal exchange rate relative to the sum of the variability of net international reserves and the variability of short-term interest rates (Table 4.8). This index ranges from zero in the case of an exchange rate peg to infinity in the case of full exchange rate flexibility. According to this index, the dollarized Latin American countries tended to have significantly less exchange rate flexibility in the period 1990–2004 than the countries in the region that have avoided significant dollarization. However, there is considerable variation among these countries, with Bolivia and Honduras showing similar degrees of flexibility as Guatemala and Mexico over this period.

An asymmetric exchange rate policy – one that allows for some nominal currency depreciation but always resists nominal currency appreciation – can provide a one-way bet for holding FCDs and encourage dollarization, especially if combined with limited exchange rate flexibility. With this type of exchange rate policy, residents would preserve their purchasing power in local currency by holding foreign currency assets, which would benefit from higher average returns as well as lower risk.

We looked at several measures of the asymmetry of exchange rate policy. First, we constructed an index of bias in exchange rate policy for the period 1990–2004 by assigning a value of −1 in months of currency appreciation and 1 in months of

Table 4.8 Latin America: indicators of exchange rate policy

		Asymmetry[2]		
	De facto flexibility[1]	Bias	Skewness	Dollarization[3]
Highly dollarized				
Bolivia	0.11	0.92	0.09	85.3
Costa Rica	0.01	0.32	0.14	56.6
Dominican Republic	0.65	0.92	0.65	25.0
Honduras	0.23	0.81	0.94	35.7
Nicaragua	0.00	1.00	−0.18	68.7
Paraguay	0.14	0.54	1.40	47.1
Peru	0.11	0.38	0.60	64.1
Uruguay	0.05	0.77	−0.32	83.0
Average	0.16	0.71	0.42	58.2
Low dollarization				
Brazil	0.34	0.54	0.57	0.0
Chile	0.93	0.26	−0.05	11.9
Colombia	0.79	0.41	0.45	2.0
Guatemala	0.12	0.09	0.33	14.9
Mexico	0.25	0.19	0.32	5.4
Venezuela	1.30	0.67	1.08	0.0
Average	0.62	0.36	0.45	5.7

Source: Authors' estimates.
1. Average of Calvo-Reinhart index for 1990–2004.
2. Average for 1990–2004.
3. Foreign currency deposits as share of total deposits for 2004.

currency depreciation, and then finding the average for the year.[10] Values of this index close to 1 indicate a bias towards currency depreciation, while a value close to −1 suggests a bias in the other direction. The results indicate that the highly dollarized Latin American countries, especially Bolivia, Nicaragua and Costa Rica, have had a stronger bias towards nominal currency depreciations than the other countries in the region.

Asymmetry of exchange rate policy could also refer to infrequent but sizable currency depreciations. For this reason, we also estimated the skewness of the distribution of monthly currency depreciations for two periods – 1990–2004 and 1980–9. According to this measure, the more positive the degree of skewness, the greater the bias towards currency depreciations; more negative degrees of skewness indicate a bias towards currency appreciation. For the period 1990–2001, we found that there were no noticeable differences in this measure of asymmetry between highly and less dollarized countries, as both groups of countries had the same average degree of skewness over this time period. However, these averages mask considerable variation over time and across countries.

Prudential guidelines, such as capital adequacy requirements or deposit insurance, can encourage banks to engage in excessive foreign currency lending. These guidelines may not force creditors and borrowers to internalize the true costs of loans in foreign currency, which should include a premium for currency risk. The highly dollarized countries in Latin America tend to have prudential requirements that are largely neutral with respect to currency denomination (Table 4.9). Honduras is the only country that limits lending in foreign currency – both overall and to non-exporting clients. Bolivia, Honduras, Peru and Paraguay apply higher reserve or liquid asset requirements on FCDs. All the highly dollarized countries in the region apply the same capital adequacy requirement to foreign and local currency assets and extend the same deposit insurance coverage to all deposits, regardless of currency denomination. These countries limit banks' net position in foreign exchange, and restrictions on the net long positions in foreign currency might create an incentive to onlend FCDs.

Countries with high FD face the potential for financial stress arising from sizable currency mismatches – liabilities in foreign currency that are not fully backed by assets or income streams also in foreign currency. This mismatch can make unwinding dollarization more risky and costly, especially if this happens in the context of a real exchange rate depreciation that could impose large losses on banks. Banks in highly dollarized countries often lend in foreign currency to many different sectors, including construction, wholesale and retail, trade and mortgages (Figure 4.2). In Costa Rica – where foreign currency loans accounted for about two-thirds of total loans in 2004 – loans to these sectors account for well over half of total loans in foreign currency. This most likely reflects confidence in the stability of Costa Rica's real exchange rate. Moreover, lending in foreign currency for mortgages adds a political economy dimension to exchange rate policy, as governments would come under strong pressure for a bail-out if homeowners ran into difficulties in paying their mortgages after a sharp

Table 4.9 Risk management arrangements in selected highly dollarized economies, 2004

	Bolivia	Costa Rica	Dominican Republic	Honduras	Nicaragua	Paraguay	Peru	Uruguay
Credit risk	No specific limits	No specific limits	No specific limits	Yes[a]	No specific limits	No specific limits	No specific limits[b]	No specific limits
Liquidity risk								
Differential liquidity/ reserve requirements	Yes	No	No	Yes	No	Yes	Yes	No
If yes, the requirements (in per cent of eligible deposits)	14 per cent + marginal on foreign currency 12 per cent − marginal on local currency			12 per cent reserve requirement and 2 per cent forced investment for all currencies 38 per cent liquidity only for foreign currency		26.5 per cent on foreign currency 15 per cent on local currency	30 per cent on foreign currency 6 per cent on local currency	
Capital adequacy requirements								
Different for foreign currency?	No		No	No[b]			No	
Deposit insurance	No		Yes	Yes		Yes	Yes	
Limited coverage			US$17,000	US$10,000		75 times minimum monthly wage	S/72,794	
What is the limit?								
Does the limit differ by currency?			No	No			No	
Lender of last resort								
Operations in foreign currency	Yes	No	No	No	No	No	Yes	Yes
Limits on banks' FX position (in per cent of capital)								
Long position	80 per cent		100 per cent	No		4 per cent[1]	100 per cent	150 per cent
Short position	20 per cent		None	15 per cent		4 per cent[1]	100 per cent	150 per cent
Indexed domestic currency instruments	UFV introduced in 2002	No	Limited use	No	No	No	Limited use	

Sources: Singh *et al.* (2005); and Fund staff.

1. As per cent of total risk-weighted assets, with some adjustments.

a. Banks can lend only 48 per cent of foreign currency deposits (33 per cent to exporters and 15 per cent to other clients).

b. The authorities plan to issue a regulation setting a higher capital requirement for foreign currency loans.

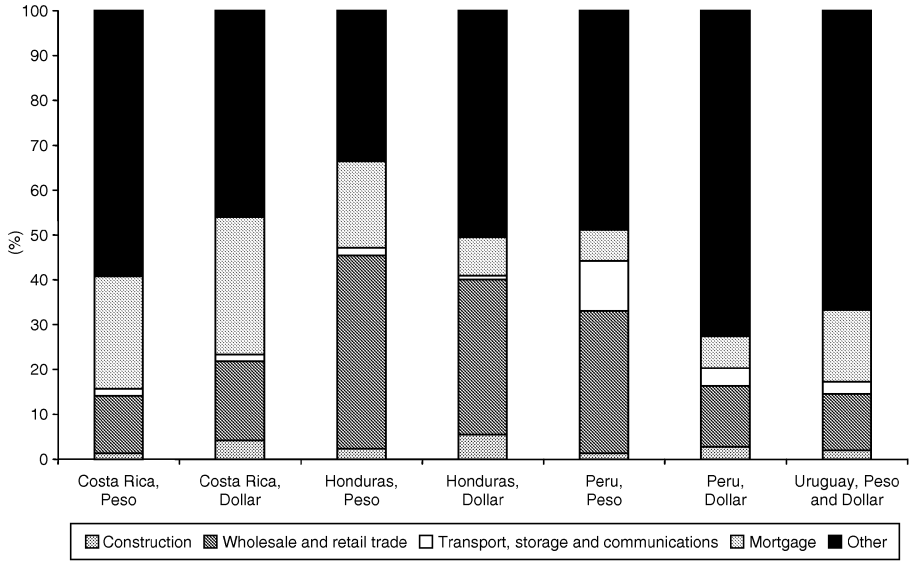

Figure 4.2 Sectoral composition of commercial bank loans, various countries (in per cent)
Source: Country authorities.

real depreciation. A similar pattern of lending occurs in Honduras and Peru (Figure 4.2).

The balance sheets of non-financial corporations also show a similar pattern. In 2001, a large share of the total liabilities of the corporate sector in Argentina, Bolivia, Costa Rica, Peru and Uruguay was in foreign currency, ranging from 53 per cent in Bolivia to 78 per cent in Uruguay (Table 4.10). These corporations appear to have been reacting in part to the high variability of domestic inflation. In addition, the Latin American countries that impose legal restrictions on dollarization, such as Colombia and Brazil, as well has having relatively stable domestic inflation, had relatively low levels of dollarization of corporate liabilities. The non-exporting sector in the highly dollarized countries also tended to have a relatively high share of dollarized liabilities to total liabilities. In Uruguay, for example, non-exporting firms had, on average, 78 per cent of their loans denominated in foreign currency. Moreover, the corporations with higher liability dollarization tended to have large net short positions in foreign currency.

As a rough measure of the extent of currency mismatches, we looked at the share of a country's FCDs in relation to its exports.[11] This measure tries to capture the extent of the banking system's vulnerability to losses from foreign exchange risk through its loan portfolio. In many dollarized countries, the level of FCDs in banks is similar to the level of foreign currency loans made by banks, because most countries impose limits on banks' net foreign exchange positions. At the same time, foreign exchange earnings of bank clients should ultimately come from the country's exports of goods and services. This measure only moderately correlates with the FCD ratio, with a correlation coefficient of 0.48. The countries with relatively high FD are fairly

Table 4.10 Corporate sector dollar-denominated liabilities, 2001 (in per cent of total liabilities)

	All firms	Non-exporting
Argentina	60.1	53.8
Bolivia	52.9	47.9
Brazil	20.4	21.5
Chile	20.5	13.8
Colombia	6.4	5.1
Costa Rica	64.3	n.a.
Mexico	33.3	14.5
Peru	63.5	61.3
Uruguay	77.6	77.5
Venezuela	34.3	n.a.

Source: Inter-American Development Bank.

Table 4.11 Latin America: indicators of currency mismatch, 2000–4 (in per cent)

	Exports[1]	FCD[2]	FCD/Exports[3]
Highly dollarized			
Bolivia	20.7	90.0	149.0
Costa Rica	44.9	48.3	37.0
Dominican Republic	45.4	25.7	19.0
Honduras	39.1	33.4	35.0
Nicaragua	23.4	70.3	145.0
Paraguay	39.7	61.5	34.0
Peru	17.4	70.1	102.0
Uruguay	23.6	86.1	202.0
Average	31.8	60.7	90.4
Less dollarized			
Brazil	14.8	6.4	10.0
Chile	34.9	11.5	13.0
Colombia	18.8	0.7	1.0
Guatemala	17.8	8.3	11.0
Mexico	18.9	7.1	8.0
Venezuela	30.6	0.2	0.0
Average	22.7	5.7	7.2

Sources: IFS, WEO and de Nicoló, Honohan and Ize (2005).
1. Average for 2000–4 of exports of goods and services in relation to GDP.
2. Foreign currency deposits as share of total deposits (average for 2000–4).
3. Foreign currency deposits as share of exports of goods and services.

open to international trade, with exports of goods and services being about a third of GDP in the period 2000–4 (Table 4.11). FCDs in these countries averaged about 60 per cent of total deposits and about 90% of export earnings. The less dollarized countries in the region had lowered a lower share of exports (about a quarter of GDP) but also had much less FD, resulting in FCDs equivalent to about 10 per cent of exports.

Empirical results

We estimated cross-section and panel data regressions that include the variables for the degree of exchange rate flexibility, bias of exchange rate policy and for the extent of currency mismatch, as well as the MVP and the rate of inflation (Table 4.12).[12] Equation 20 suggests that these variables explain a significant share of the differences in FD across countries. The MVP, inflation and restrictions on FD remain statistically significant, plus the bias towards currency depreciation and larger currency mismatches also explain FD. The degree of exchange rate flexibility (the variable 'Float') is not statistically significant, possibly because its effects are captured by the MVP. We must caution that the cross-section equation could be picking up the endogeneity of the bias towards currency depreciation and the currency mismatch, which could be affected by the extent of FD. Equation 21 looks at the evolution of FD over time, and uses the lagged values of these variables to minimize the endogeneity problem. This equation shows that FD is explained by the bias towards currency depreciation, the currency mismatch as well as inflation and the MVP, but the degree of exchange rate flexibility is not statistically significant. Interestingly, the central government balance now becomes statistically significant, with larger surpluses contributing to lower FD. The measures of the degree of skewness of the distribution of currency depreciations for 1990–2001 and 1980–9 were not statistically significant in either equation (not shown in the table), probably

Table 4.12 Deposit dollarization: effect of exchange rate policy[1]

	(20)	(21)
Equation	Cross-country	Panel data
MVP_t	0.35	0.04
	(0.00)	(0.03)
$Inflation_t$	0.04	0.002
	(0.00)	(0.15)
$Float_{t-1}$	−0.91	0.00
	(0.22)	(0.85)
Restriction	−2.7	–
	(0.19)	
Government $balance_{ma(3)}$	−0.05	−.40
	(0.91)	(0.01)
$Asymmetry_{t-1}$	13.4	1.83
	(0.02)	(0.07)
Currency $mismatch_{t-1}$	22	14.33
	(0.00)	(0.00)
Constant	5.8	17.9
	(0.03)	(0.00)
No. of observations	61	331
No. of countries	61	46
R-squared	0.80	–

Sources: The data sources, variable definitions and estimation methodology are presented in Appendices 4.1 and 4.2.
1. *P* values are presented in parentheses.

because of the significant variation in the skewness measure across countries and over time.

There appear to be two equations that provide good explanations of FD – equation 11 with a lagged dependent variable, the MVP and inflation and equation 21 with the MVP, inflation, exchange rate flexibility, central government balance, asymmetry and the currency mismatch. The out-of-sample forecasts for the period 2002–4 suggest that both models capture the main trends in FD in some of the highly dollarized countries in the region (Figure 4.3). Both models correctly point

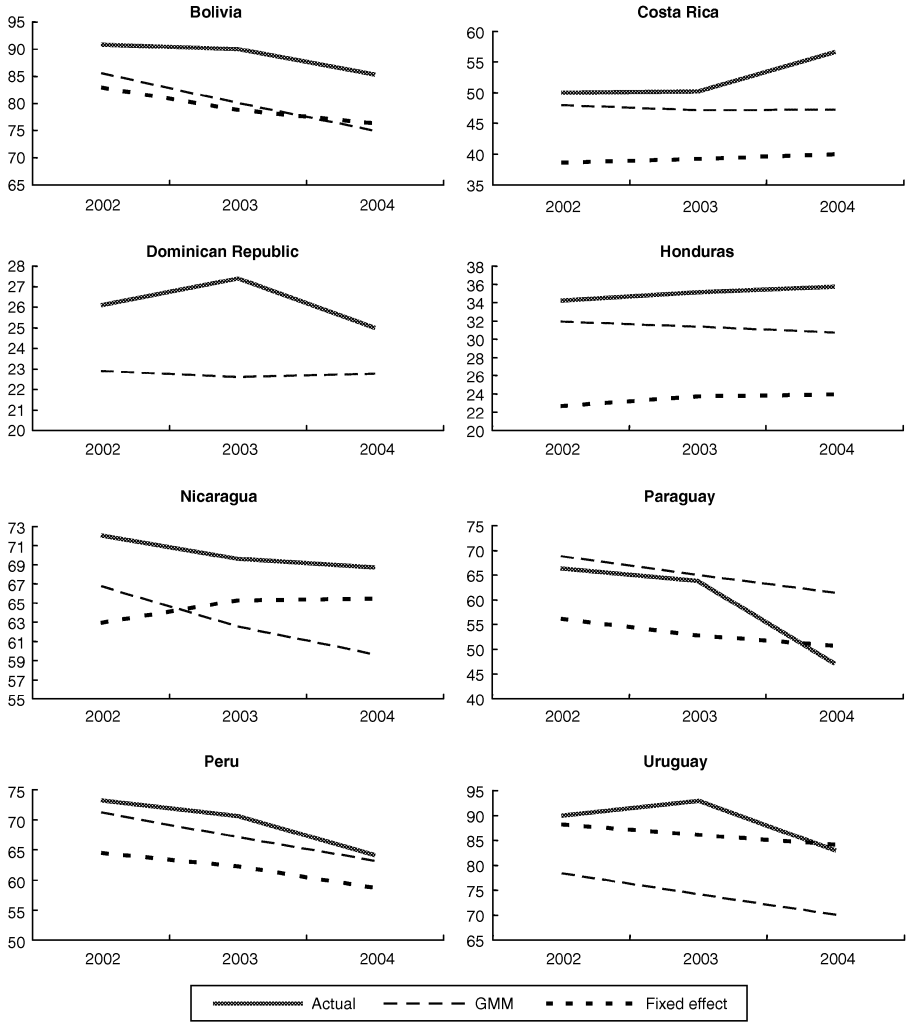

Figure 4.3 Deposit dollarization: out-of-sample forecast

Source: Authors' calculation.

to declines in FD in Bolivia, Nicaragua, Peru and Uruguay and to broadly stable FD in the Dominican Republic and Honduras. However, the models miss the rise in FD in Costa Rica and the sharp drop in FD in Paraguay in 2004.

4.5 Concluding remarks

These results provide evidence that FD is a rational response to uncertainty about inflation. FD tends to remain high in countries with unstable and high domestic inflation and with institutions that undermine confidence in the outlook for inflation. The evidence on the role of the central government balance is mixed, although equation 21 supports the view that larger fiscal surpluses do help reduce FD. Legal restrictions may have been effective in preventing FD, most likely in countries with low inflation or effective indexation mechanisms to preserve purchasing power in local currency. In countries that already have high FD, imposing such restrictions could create strong incentives to place financial savings offshore, leading to a costly economic adjustment. The study also finds that an exchange rate policy that is biased towards depreciation tends to contribute to high FD, although the skewness measure of asymmetry is not statistically significant. The degree of exchange rate flexibility probably also matters, but these effects appear to be captured by the MVP. This exchange rate policy cuts the risk of lending and saving in foreign currency and tends to enhance the rate of return on foreign currency assets. Countries with high FD also have significant currency mismatches, which are encouraged by exchange rate policy as well as by prudential regulations that are largely currency neutral.

The results also point to strong persistence in FD, with a high and statistically significant coefficient on the lagged dependent variable. However, this persistence does not appear to reflect the legacy of high inflation in the 1980s, as the free-fall indicator and the skewness of exchange rate policy during the 1980s do not appear to have a significant effect on FD. The persistence could reflect the effect of currency mismatches and policies – such as exchange rate policy and prudential regulations – that create incentives for residents to continue to hold FCDs. At the same time, the extent of FD probably also explains currency mismatches and imposes limits on exchange rate policy, and the causality implied by the econometric results needs to be interpreted with caution. But this is precisely the point of the explanation of dollarization in Ize (Chapter 2 of this volume) – economies with highly variable inflation and financial market imperfections can find themselves locked into an equilibrium with high FD because of the very high economic costs of moving to a low dollarization equilibrium.

These results suggest that countries with significant FD should strive to encourage the use of domestic currency by maintaining macroeconomic stability, with low and stable inflation; allowing for more exchange rate flexibility and less bias towards depreciation; and strengthening institutions to improve confidence in the sustainability of economic policies. Highly dollarized countries should adapt their prudential regulations to ensure that creditors and debtors internalize the costs associated with FD. At the same time, restoring confidence in the domestic currency may take many years of sound policies and may require a careful approach to limit the transition costs of returning to a low dollarization equilibrium.

Appendix 4.1 Data description

Variable description

Variable name	Variable description	Source
Dependent variable		
Deposit dollarization ratio	FCDs in per cent of total bank deposits.	DNHI
Independent variables: macro indicators		
D_{t-1}	Lagged deposit dollarization ratio.	DNHI
D_{t-1} Latin America	Lagged deposit dollarization ratio interacted with a dummy variable for Latin America (1 for Latin American countries and 0 otherwise).	–
MVP	Minimum variance portfolio as constructed by Ize and Levy Yeyati (2003). The unit is in percentage, not in decimal fraction. See below for details of computation.	IFS
MVP Latin America	MVP interacted with a dummy variable for Latin America.	–
Restriction	Index for restriction on FCDs. '0' represents no restriction and higher scores represent heavier restriction.	DNHI
Inflation	3-year backward-looking average inflation rate calculated as a percentage change in CPI.	IFS
Government balance	3-year backward-looking average of the government balance in per cent of GDP. Negative figures imply deficits.	WEO
Free-fall (80s)	The number of months during the 1980s in which 12-month inflation is above 40 per cent.	RR
Depreciation	3-year backward-looking average of nominal depreciation, i.e., percentage change of the exchange rate measured by national currency unit per US dollar.	IFS
Float	Calvo and Reinhart index of exchange rate flexibility	IFS
Asymmetry	Index of asymmetry of exchange rate movements. Constructed by assigning a value of −1 in months of currency appreciation and 1 in months of currency depreciation, and then averaging for the year.	IFS
FCD/Export	FCDs divided by exports. The unit is not in per cent, but in decimal fraction.	DNHI, WEO, IFS
Governance variables[1]		
Voice and accountability	Index of voice and accountability by Kaufmann, Kraay and Mastruzzi. Average for the years 1996, 1998, 2000 and 2002.	WBGOV

Continued

Table Continued

Variable name	Variable description	Source
Regulatory quality	Index of regulatory quality by Kaufmann, Kraay and Mastruzzi. Average for the years 1996, 1998, 2000 and 2002.	WBGOV
Rule of law	Index of rule of law by Kaufmann, Kraay and Mastruzzi. Average for the years 1996, 1998, 2000 and 2002.	WBGOV
Control of corruption (WB) used in Table 4.6	Index of control of corruption by Kaufmann, Kraay and Mastruzzi. Average for the years 1996, 1998, 2000 and 2002.	WBGOV
Democratic process	Political risk rating on democratic accountability.	PRS
Bureaucracy	Political risk rating on bureaucracy quality.	PRS
Control of corruption used in Table 4.7	Political risk rating on corruption.	PRS
Internal conflict	Political risk rating on internal conflict.	PRS
Law and order	Political risk rating on law and order.	PRS

Note: 1. For all governance indicators, higher scores imply better governance and lower risk.

Computation of MVP

MVP for year t was computed using a formula

$$MVP_t = \frac{Corr(\pi_t, n_t) \cdot \sigma(\pi_t)}{\sigma(n_t)}$$

where π_t and n_t represent inflation and depreciation of the nominal exchange rate respectively.[13] The correlation coefficient and standard deviations were estimated using quarterly data over a ten-year horizon; that is, to estimate MVP for year t, we used quarterly data of inflation and depreciation from year $t-9$ to year t.

MVP represents domestic agents' optimal portfolio of FCDs over total deposits, and the agents cannot usually have a short position. To incorporate this, we assigned MVP a value of 0 if the estimate of *Corr* (n_t, p_t) was negative and a value of 100 if the estimate of MVP exceeded 100.

Data sources

DNHI: de Nicoló, G., P. Honohan and A. Ize (2005) 'Dollarization of Bank Deposits: Causes and Consequences', *Journal of Banking and Finance*, Vol. 29, No. 7, pp. 1697–727.

International Financial Statistics (IFS), International Monetary Fund.

Political Risk Rating (PRS): political risk rating by the Political Risk Services Group (www.prsgroup.com).

RR: Reinhart, C. and Rogoff, K. (2002) 'The Modern History of Exchange Rate Arrangements: A Reinterpretation', NBER Working Paper No. 8963 (Cambridge, MA: National Bureau of Economic Research).

WBGOV: Kaufmann, D., A. Kraay and M. Mastruzzi (2003) 'Governance Matters III: Governance Indicators for 1996–2002', World Bank Policy Research Working Paper No. 3106, 30 June.
World Economic Outlook (WEO) (2004), International Monetary Fund.

Appendix 4.2 Estimation methodology

1. Cross-country regressions (Tables 4.6 and 4.12)

For cross country regressions, we converted our panel dataset into a cross-country dataset by averaging variables over years for each country. Then, we ran ordinary least squares (OLS) regressions of deposit dollarization ratio on the independent variables specified in the tables.

2. Panel data regressions (Tables 4.7 and 4.12)

We used an unbalanced panel dataset with 47 countries and the period 1990–2001 and estimated two models:

- Model 1 (without the lagged dollarization ratio): $D_{it} = c + \beta^{*}MVP_{it} + \gamma X_{it} + u_i + v_{it}$
- Model 2 (with the lagged dollarization ratio): $D_{it} = c + \alpha D_{it-1} + \beta^{*}MVP_{it} + \gamma X_{it} + u_i + v_{it}$

where D_{it} represents the deposit dollarization ratio, MVP_{it} the minimum variance portfolio, X_{it} other independent variables and u_i country-specific effects. We make standard assumptions for the disturbance term v_{it}:

$$E(v_{it}) = 0, E(v_{it}u_i) = 0 \,\forall t; E(v_{it}v_{is}) = 0 \,\forall t \neq s.$$

Model 1 was estimated with standard fixed and random effect models without instrumental variables.

Model 2 was estimated with the two-step system GMM method developed by Blundell and Bond (1998).[14] We chose this estimator over a standard fixed or random effect estimator because the latter generates biased coefficient estimates under the presence of the lagged dependent variable in the right-hand side. We chose the system GMM method over the so-called difference GMM method because the difference GMM method is known to suffer from weak instrumental variables problems when the coefficient on the lagged dependent variable is close to one, and the system GMM method can circumvent this problem.[15] To address small-sample downward biases on standard errors in two-step estimations, we used a corrective method invented by Windmeijer (2005).

Our result for the baseline regression (equation 11 in Table 4.7) passes standard diagnostic tests. The Sagan test does not reject the hypothesis of no over-identifying restrictions. The second-order serial correlation in the first differences of residuals is not detected, thereby validating the foundation of the GMM moment conditions. In addition, the coefficient estimates do not change significantly when a smaller number of moment conditions are used or when the constant term is excluded from the right-hand side.

Notes

1. The authors would like to thank Roberto Garcia-Saltos, Kevin Cown, Alain Ize, Eduardo Levy Yeyati, Chris Towe and the participants in a seminar at the IMF for their comments. They would also like to thank Genevieve Mendiola for superb research assistance.
2. This differs from official, full dollarization, which entails the legal adoption of a foreign currency as the sole monetary unit of a country. Currently, Ecuador, El Salvador and Panama are the only three Latin American countries with this monetary regime.

3. The costs and benefits of FD are discussed fully in Baliño, Bennett and Borensztein (1999). Reinhart, Rogoff and Savastano (2003) challenge the notion that dollarization limits the scope for an independent monetary policy.
4. Singh *et al.* (2005), p. 82.
5. The companion papers in this volume by Ize (Chapter 2) and Ize and Levy Yeyati (Chapter 3) more thoroughly review the theoretical explanations of FD.
6. When all of the indicators of institutional quality are included in one equation, none of the coefficients is statistically significant, suggesting the presence of multi-colinearity.
7. The estimation methodology is described in more detail in Appendix 4.2.
8. When both inflation and nominal exchange rate depreciation are included in the same equation, both coefficients are statistically insignificant.
9. The model makes the crucial assumption that projects returns rise with a real exchange rate depreciation. This means that borrowers in foreign currency would perceive that they would benefit as well from a real depreciation.
10. Periods of no change in the exchange rate were assigned a value of 0.
11. Goldstein and Turner (2004) propose a broader, more aggregated measure of the currency mismatch for an economy.
12. Including a lagged dependent variable in equation 21 led to counterintuitive results.
13. Under an assumption that agents regard the US inflation as fixed, our formula is equivalent to the original definition from Ize and Levy Yeyati (2003).
14. This method requires additional assumptions that $E(D_{i\,1}v_{it}) = 0 \forall t$ and $E((u_i + v_{i3})\Delta D_{i2}) = 0$ for each i.
15. In fact, the difference GMM method produces a coefficient estimate on the lagged dependent variable of around 0.36, much smaller than the estimate by the system GMM method.

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Comments on Chapter 4

Kevin Cowan

I want to focus my comments on the Nozaki and Rennhack paper. In particular, I would like to do three things. First, offer a very brief summary and discussion of their main results. Second, complement the facts presented in the paper with some additional empirical characteristics of dollarization in Latin America. Finally, discuss the policy implications of the paper's main findings both for the optimal choice of monetary and exchange rate policies and for the specific regulatory changes in the financial sectors of Latin American economies.

Summary and discussion

The first very valuable contribution of the paper is to update existing data on the level of bank dollarization into 2004.[1] By doing so the authors are able to document an important new development in dollarization in Latin America. Unlike the 1990s, which saw rising dollarization levels in most countries, the share of foreign currency deposits (loans) in total loans (deposits) has stabilized or has fallen in all but two countries in the region in the current decade. Granted, the level of dollarization is still high in many countries (most notably Bolivia, Nicaragua, Peru and Uruguay) but at least there is a reversal in the direction of change.

The second contribution is to extend existing cross-country empirical work on the determinants of dollarization. The paper does so in two directions. The first is to incorporate additional macroeconomic determinants of dollarization; the second to exploit time variation in dollarization levels (and their determinants) using a panel approach.[2] Their main results confirm previous findings: in countries where inflation has historically been volatile vis-à-vis the real exchange rate, dollar debt is high, suggesting that it is used as partial insurance against future inflationary shocks. Next, the paper finds a high degree of persistence in the levels of financial dollarization. The paper also provides evidence that recent fiscal policy (as measured by the central government deficit), exchange rate asymmetry (measured as a bias towards depreciation) and currency mismatches all have significant positive effects on dollarization. Finally, the authors find no effect of the exchange rate behaviour (as measured by the Calvo and Reinhart fear of floating measure) on dollarization.

The model behind the empirical specification is a portfolio model, in which agents choose the optimal share of dollar assets (liabilities) based on the relative variances, and covariance of inflation and the real exchange rate. Since financial contracts are forward-looking, portfolios are determined by agents' beliefs regarding the movement of these two variables. These beliefs are not observable, which leads to a choice of variables with which to proxy (or infer) the beliefs.

The initial approach followed in the paper (and indeed the rest of this literature) is to infer the population variances and covariances from a sample spanning the last ten years and construct a MVP based on this statistics. This approach gives the same weight to all observations in the sample (what happened ten years ago is the same as what happened last month), and no weight to observations outside the window. In addition to the constructed MVP, the authors add additional contemporaneous policy outcomes to the regression, which in principle allows for recent events to have a differential impact on dollarization decisions. It is in this vein that current exchange rate flexibility and inflation variables are incorporated. In turn, the simultaneous inclusion of government spending variable would imply that a government deficit will have an effect on future relative price uncertainty not captured by the history of inflation and real exchange rate movements nor by current inflation levels.

My first (and main) concern regarding this approach is in the interpretation of the empirical results. Does a non-significant coefficient on the current exchange rate regime imply that the choice of exchange rate regime does not matter for dollarization? The answer is clearly no. The only implication is that it has no additional effect beyond that which may be already captured in the MVP. For example, if a country has followed a similar exchange rate regime in the last ten years, then is should come as no surprise that the current exchange rate regime has no significant effect. The same applies to the level of inflation and government deficits.

An alternative approach would be to factor the effects of regime *changes* rather than regime *levels* into the analysis. One would expect a smaller effect of the historical MVP on dollarization in a country that has recently undergone important institutional reforms – be it fiscal reforms or the establishment of an independent central bank, since in this case past outcomes are poorer predictors of future outcomes.

This leads me to my second comment. Why not explore the policy determinants of the MVPs directly? In particular, it would be extremely interesting from a policy perspective to know whether MVPs are higher in countries with high average inflation. How exchange rate regimes (de jure or de facto) impact MVPs is another key question that could be explored in this framework.

Third, what is the correct measure of variances and covariances in the CAPM model? The variance of total inflation (or real depreciation) or the variances of the forecast errors? If uncovered interest parity holds (as in the Ize and Levy Yeyati [2003] model), then the model suggests that all expected changes will be factored in to the interest rate differential, leaving only the unexpected component as a determinant of the optimal portfolio.

Next, I have some specific concerns regarding the construction of the three exchange rate measures. First, following the MVP framework, it is not clear why

the relative variance of the interest rate and reserves vs. the exchange rate should be a determinant of dollarization. If anything, one could argue more clearly for reverse causality, with dollarization determining fear of floating. This is in fact the specification that Calvo and Reinhart (2002) estimate in their paper. Second, I would argue that the measures of skewdness and asymmetry of the nominal exchange rate should be consistent with the measures of variance and covariance used in the MVPs, and hence should be based on the same ten-year sample. Third, it is not clear why the measure of exchange rate asymmetry should affect dollarization levels. The authors argue that an asymmetrical exchange rate, i.e., one with many depreciations and few appreciations is an incentive for dollarization. However, this should be factored in to the expected depreciation, and hence to the interest rate parity condition. For asymmetry to matter we would need to depart from the simple CAPM setting to a model in which depreciations have a different effect than appreciation. This is an interesting (and unexplored) avenue for additional research.

Finally, as this is a policy volume, I would like to flag some empirical results obtained elsewhere in the literature that are particularly relevant for the policy debate on dollarization in Latin America. The first is that widespread use of domestic price indexation has a significant negative effect on the level of financial dollarization (Ize and Levy Yeyati, 2003). Hence, the establishment of credible price indexation mechanisms appears as a plausible way of reducing financial dollarization without generating capital flight. This is an issue discussed extensively elsewhere in this volume. The second is that banking regulation; specifically currency-blind deposit insurance has significant positive effects on dollarization. Controlling for the existence of some form of deposit insurance, dollarization is higher in those countries with currency-blind insurance (Inter-American Development Bank [IADB] 2005).

Additional data

Financial vulnerabilities do not arise from financial dollarization, but from a mismatch between the currency composition of assets (or income) and liabilities. Therefore, when looking at currency mismatches across countries it is crucial to look both at the average levels of dollarized debt and at how this debt is distributed within the economy. With this in mind I would like to complement the data on the level and distribution dollarization provided in this paper with some additional data put together recently by the IADB (IADB, 2005).

Figure 4C.1 summarizes information on the share of total loans (in domestic and foreign currency) going to the tradable sector (agriculture and industry), and the fraction of total loans denominated in foreign currency in the banking system for countries in the Latin America and Caribbean region. A minimum estimate of the level of currency mismatches can be obtained by assuming that all loans absorbed by the tradable sector are denominated in dollars, with the remaining dollar loans being picked up by the non-tradable sector. The presumption is that the tradable sector is better prepared to deal with dollar loans either because it directly exports part of its output or because prices move

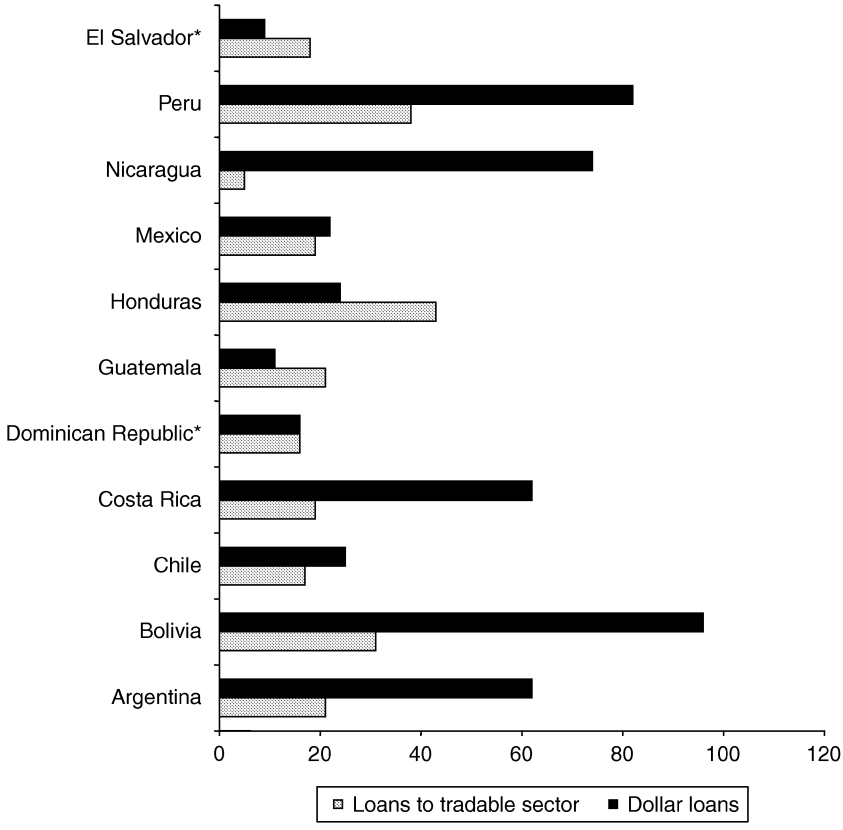

Figure 4C.1 Mismatch in bank lending in Latin America and the Caribbean (percentage of total loans, 2001)

Sources: Bank superintendencies; de Nicoló, Honohan and Ize (2005); Arteta (2005).

Note: *The share of dollar loans over total loans was replaced by the share of dollar deposits over total deposits.

in step with the exchange rate. The figure shows that in many economies in the region, loans denominated in dollars are considerably larger than the total loans to the tradable sector, suggesting that currency mismatches in these countries are substantial.

A more detailed picture of currency mismatches can be obtained for a smaller sample of countries for which currency composition data are available at the firm level. Figure 4C.2 shows the median shares of dollar-denominated liabilities in total liabilities for firms operating in both the tradable and non-tradable sectors in 2001 in selected countries in Latin America. The figure shows that firms in the non-tradable sector were highly leveraged in foreign currency debt in countries with high levels of financial dollarization: Argentina, Costa Rica, Peru and Uruguay. The figure also shows that firms in the tradable sector are more highly

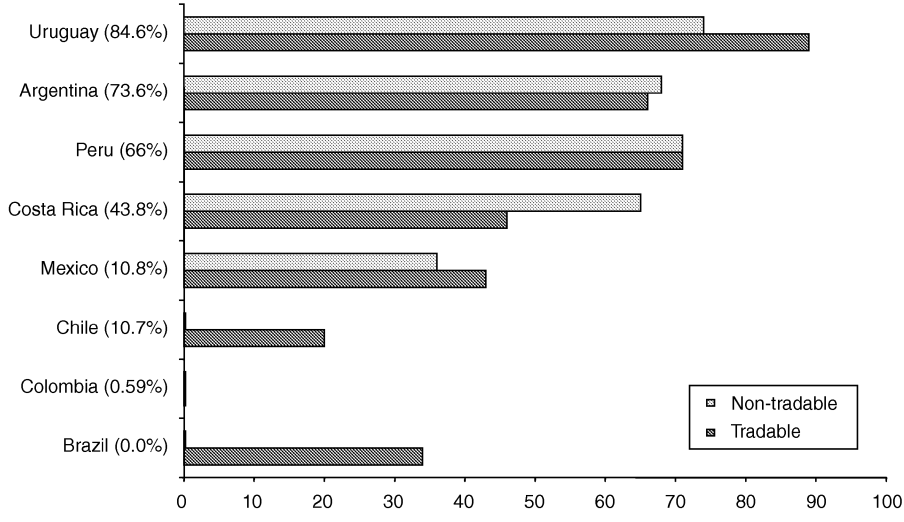

Figure 4C.2 Liability dollarization in the tradable and non-tradable sectors (median value, per cent, 2001)

Source: Cowan and Kamil (2004).

Note: Figures in parentheses denote the level of deposit dollarization in each country in 2001.

dollarized than firms in the non-tradable sector in countries with low overall financial dollarization: Brazil, Chile and Mexico. In highly dollarized economies, this is not the case; the gap between tradable and non-tradable dollarization disappears or reverts, as in the case of Costa Rica.

This last finding has two possible explanations. First, if the share of dollar loans in total loans is sufficiently high, then it will be inevitable that some dollar loans spill over into the non-tradable sector. In other words, in countries where financial dollarization is high, no matter how much banks try to reduce mismatches, debtors from the non-tradable sector end up with debts denominated in tradables, increasing their exchange rate exposure. Second, differences across countries in the degree to which firms match their liabilities to the exchange rate elasticity of their revenues might reflect other important differences in the economic and institutional structure that affect the incentives for firms or banks to hedge. This is an issue that merits additional research.

Policy implications

I would like to finish these comments by discussing the implications of the paper's empirical findings for policy design in Latin America.

Should dollarization be prohibited? It is common for policy discussion to address financial dollarization with a strong prior: dollarization poses a significant threat for economic stability. The empirical results presented in this paper (and its predecessors) suggest that this view is at best partly correct. While there is growing evidence that

financial dollarization does indeed render countries vulnerable to exchange rate shocks, it ignores other shocks – in particular price shocks – and their effects on economic stability. Hence, the effects of the MVP on dollarization documented in this paper suggest that part of dollarization is an optimal decision, in which price risks are traded off against real exchange rate risks. Restricting dollarization fully by regulation is therefore likely to lead to capital flight (de Nicoló, Honohan and Ize, 2005; IADB, 2005) or excessive use of nominal financial contracts. Unless a market failure that leads to excess dollarization is identified, full restrictions will be welfare reducing.

Should economies alter their monetary and exchange rate policy regime to reduce dollarization? In as much as the MVP is a function of the relative variances of inflation and depreciation, then the results presented in this paper indicate that a regime that credibly reduces inflation volatility vis-à-vis exchange rate volatility regime should reduce dollarization. For example, countries that adopt some form of inflation-targeting (IT) regime in which inflation expectations are targeted while the exchange rate is allowed to fluctuate should see their levels of financial dollarization drop. Various additional pieces of evidence corroborate this result. There is evidence that this is what happened in Chile after fully fledged IT was adopted in 1999 (Cowan, Herrera and Hansen, 2005). There is additional evidence that IT regimes contribute to fixing inflation expectations (Mishkin and Schmidt-Hebbel, 2005). However, this paper does not provide direct evidence that changes in policy regimes affect dollarization levels. Additional work on the determinants of MVPs or on the differential effect of calculated MVPs across regimes are needed to complement existing evidence.

An important issue – closely related to the previous discussion on policy regimes – is the speed at which dollarization ratios adjust to changes in monetary/exchange rate policy. One possible interpretation of the high level of persistence of dollarization the authors find in the panel estimations is that adjustment towards the new long-run level of dollarization is very slow. In the interim, a regime in which the exchange rate is allowed to fluctuate will be left vulnerable to exchange rate shocks. This suggests that temporary restrictions may be optimal in the transition period. An alternative interpretation is that adjustment is fast, but the constructed MVP is a poor measure of agents' beliefs.[3] If regime changes alter these beliefs persistently (in ways not captured by the historical MVP), then the estimated coefficient on the lagged dollarization levels is simply capturing a slow-moving omitted variable. This being the case, dollarization is not persistent (in a partial adjustment sense) and will fall if credible regime changes are implemented. Unfortunately, the empirical results presented in this paper cannot be used to separate the two hypotheses. Additional work, which looks at credibility and the formation of beliefs in a more systematic manner, is therefore needed.

Finally, what regulatory changes are needed to reduce dollarization? The paper discusses the role of financial sector regulation in determining the level of financial dollarization. In particular, the paper argues that most bank regulations in the region are blind to currency denomination. Galindo and Leiderman (2005) arrive at similar conclusions in an earlier study. The problem is regulation that appears 'neutral' on paper may actually increase dollarization levels. Broda and Levy Yeyati

(2003) show that if there is no discrimination against dollar deposits and a relatively high coverage under the deposit insurance scheme, the banking system will endogenously generate an inefficiently high level of deposit dollarization. Existing empirical evidence corroborates this argument by showing that currency-blind deposit insurance has significant effects on dollarization levels (IADB, 2005). This suggests that there is room for reform in Latin America in this area.

Notes

1. Most previous empirical work relied on samples that extended only until 2001.
2. The model behind their analysis is a CAPM portfolio model, from Ize and Levy Yeyati (2003).
3. As discussed above, measured MVPs ignore regime changes and their effects on credibility.

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Part II
Monetary Policy

5
Inflation Targeting in Dollarized Economies

Leonardo Leiderman, Rodolfo Maino and Eric Parrado[1]

5.1 Introduction

An increasing number of emerging market economies have been adopting IT as their monetary policy regime. There is reason to believe that this shift has contributed to the relatively low inflation observed in these economies.[2] This outcome has surprised those who maintained that these economies are far away from the preconditions required for implementing IT. In particular, the existence of managed exchange rate regimes under foreign exchange market intervention, of a narrow base of domestic nominal financial assets and the lack of market instruments to hedge exchange rate risks, together with fear of floating, have been stressed as factors that drastically weaken the efficacy of monetary policy. Accordingly, these factors have been frequently seen as obstacles to IT implementation in a typical emerging market economy.

Inflation targeting would seem even more difficult in a highly financially dollarized economy. Consider an emerging market where debts are denominated in dollars while firms depend on local currency receipts. Under these conditions, private sector and banks' balance sheets can be vulnerable to the type of nominal and real exchange rate shifts that should occur for standard inflation targeting to work effectively. In particular, through balance sheet effects, large real exchange rate depreciations (e.g., due to a sudden stop) could have a contractionary impact on output and be associated with bank failures. This contrasts with their expansionary impact on net exports and output in standard small open economy analysis.[3] Another difficulty has to do with the exchange rate pass-through to prices, which has been argued to be relatively high for dollarized economies. Yet, if this is the case, this would make monetary policy more potent in terms of its impact on exchange rates and prices.

In spite of these difficulties, some highly dollarized economies, such as Peru, have successfully adopted IT as their monetary policy regime. The authorities of Bolivia, another highly dollarized economy, have also expressed their interest in making a gradual transition towards IT. In light of such revealed policy preference for IT, the question arises of whether this regime can successfully accommodate the special characteristics and dynamics of high dollarization.

This chapter examines various aspects of monetary transmission and policy formulation in highly dollarized economies. We compare two highly dollarized economies, Peru and Bolivia, with two economies with low levels of dollarization, Chile and Colombia. We conclude that, while high dollarization does introduce significant differences in both the transmission capacity of monetary policy and its impact on the real and financial sectors, it does not seem per se to preclude the use of IT as an effective policy regime. Moreover, the way in which the IT regime is implemented can be adapted to reflect the limitations and risks associated with a dollarized environment. In addition, we find that the way in which an economy responds to monetary policy is very much regime dependent. Thus, a regime shift towards IT will tend over time to induce shifts in underlying behavioural parameters that magnify the response to policy signals, thereby facilitating the conduct of monetary policy.

We start, in Section 5.2, by identifying the key differentiating factors in terms of monetary transmission and monetary policy formulation in a highly dollarized environment. We then briefly review, in Section 5.3, the overall monetary performance of Peru and Bolivia in recent years and conclude that in both cases it was quite good, although of a very different nature.

In Section 5.4, we compare the dynamics of key transmission variables for Chile (an IT economy with very low financial dollarization) against Peru. As expected, we find that the degree of exchange rate pass-through has been higher for Peru than for Chile. Moreover, while in Chile interest rate shocks tend to dominate exchange rate shocks in terms of their impact on inflation, we find the reverse for Peru. However, we also find that Peru's pass-through has diminished with the implementation of IT, while the impact of interest rates has increased. We also examine whether there are indications of increased financial sector fragility in a dollarized economy that could limit the scope of monetary policy. Indeed, we find that the real bilateral exchange rate Granger causes non-performing loans (NPLs) in Peru but not in Chile. We view these findings as being consistent with balance sheet effects reflecting the higher vulnerability of loan portfolios in more dollarized economies.

In Section 5.5, we estimate monetary policy reaction functions (Taylor rules) for Chile, Colombia, Peru and Bolivia. We find strong evidence of fear of floating. Monetary policy in Chile and Colombia has reacted more aggressively to movements in inflation than in Bolivia and Peru. Instead, we find that monetary policy in the two highly dollarized economies has responded more actively to pressures in the exchange market, as reflected in changes in international reserves or changes in the exchange rate. Section 5.6 concludes with some remarks about further topics for research and a discussion of some policy implications.

5.2 How does dollarization affect monetary policy?

Standard small open-economy inflation-targeting models, such as Ball (1999) and Svensson (2000), embody a central role for the exchange rate in the transmission from monetary policy to inflation. Accordingly, a rise in the domestic interest rate – aimed,

for example, at dealing with the potential inflationary impact of a sudden stop in capital inflows – typically leads in the short term to nominal and real exchange rate appreciation, which in turn helps attenuate inflationary pressures through both direct and indirect channels. The direct channel reflects the impact of the exchange rate change on the change in the consumer price index (e.g., through the domestic price of tradables). The indirect channel works through the contractionary impact of real exchange appreciation on aggregate demand, output and prices. In some cases, these changes may be accompanied by fluctuations in the country risk premium.

Turning to the case of a financially dollarized economy, where a substantial fraction of deposits and loans are denominated in dollars, the main differences we see as regards the monetary transmission mechanism are as follows. First, we would generally expect the exchange rate to play a more important anchoring role than in a non-dollarized economy, thereby inducing a higher pass-through of exchange rates on prices. Such effects might possibly be non-linear as larger depreciations may raise credibility issues. Second, it is plausible to argue that balance sheet effects would give rise to contractionary devaluations and induce financial stress. That is, instead of real exchange rate depreciation having a positive impact on output, one would observe a negative impact; quite a different dynamic than in the standard case.

In turn, the potentially adverse impact of large exchange rate fluctuations is likely to induce fear of floating by the authorities and require that they closely target the exchange rate, even when the underlying shocks are transitory.[4] To facilitate such targeting, the authorities may consider using direct foreign exchange market intervention as an additional policy instrument. Such 'leaning against the wind' can be consistent with, and even strengthen, an inflation-targeting framework, as long as such intervention is not aimed at targeting a specific trend for the real exchange rate.

The possible monetary policy responses to dollarization can be characterized with the help of a simple typology that broadly summarizes recent monetary experiences in Latin America, as shown in Table 5.1.[5] Under a conventional full-fledged inflation targeting (FFIT) regime, the primary final target is inflation and the operational target is the interest rate. Thus, shocks are primarily absorbed by the exchange rate and foreign exchange interventions are only used occasionally to help smooth out exceptionally large shocks. Instead, under fear of floating competitiveness targeting (FFCT), the primary final target is competitiveness and monetary authorities limit exchange rate fluctuations by using the rate of crawl as the operational target. Thus, foreign exchange intervention is the norm rather than the exception, and international reserves must bear the brunt of the adjustment against shocks. To help reduce the burden of adjustment on international reserves, FFCT countries also need to adjust the interest rate in response to shocks. To boost and speed up this response, some countries have used an intermediate inflation targeting (IIT) regime, such that a monetary aggregate (typically bank reserves) replaces the interest rate as the operational target. Thus, a decline in demand for bank reserves caused by an incipient capital outflow immediately and automatically boosts interest rates.

Table 5.1 Alternative monetary frameworks

	Full-fledged inflation targeting (FFIT)	**Intermediate inflation targeting (IIT)**	**Fear of floating competitiveness targeting (FFCT)**
Primary final target	Inflation	Inflation	Competitiveness
Secondary final target	Competitiveness	Competitiveness	Inflation
Operational target	Interest rate	Monetary aggregate	Rate of crawl
Primary shock absorber	Exchange rate	Interest rate	Foreign assets
Secondary shock absorber	Foreign assets	Exchange rate/foreign assets	Interest rate

Table 5.2 Volatility of selected variables

	REER		**GDP**		**International reserves**		**Interest rate**	
	1995–9	**2000–5**	**1995–9**	**2000–5**	**1995–9**	**2000–5**	**1995–9**	**2000–5**
Bolivia	3.66	4.92	1.66	2.30	39.73	23.94	5.16	2.67
Chile	5.74	7.47	4.66	1.66	15.90	4.67	2.86	2.53
Colombia	10.52	11.18	3.95	1.38	13.84	7.71	8.08	2.26
Peru[1]	5.23	3.12	4.21	1.26	21.54	11.36	2.62	0.52

Source: IFS.

1. For Peru, the periods considered were 1995–2001 and 2002–5.

The recent (post-1999) policy regimes followed by Chile and Colombia can be classified as FFIT. Both countries experienced relatively high exchange rate volatility but relatively low international reserves volatility (Table 5.2). The current regime (post-2002) in Peru also approximates FFIT, although it has included more substantial foreign exchange market intervention, resulting in much lower exchange rate volatility than in Chile or Colombia. Previously, Peru's regime, which used bank reserves as the operational target, resulting in very high interest rate volatility, could be characterized as IIT. Last, the monetary regime in Bolivia during most of the last decade exhibited clear FFCT characteristics, with a large volatility in international reserves and interest rates.

5.3 The recent monetary experiences of Peru and Bolivia

To assess whether FFIT can work in a dollarized economy, Peru's recent experience since it formally adopted its IT regime in 2002 is worth reviewing in some detail.[6] For about a year, up to the first half of 2002, monetary policy faced deflationary

risk in the context of an almost zero growth economy, leading to a gradual cut in the policy rate to 2.5 per cent (Figure 5.1). However, changing conditions led to a gradual hike in the policy rate to 3.8 per cent at the end of 2002. After holding the rate at this level for half a year, underlying conditions allowed for a succession of interest rate cuts, which brought the interest rate to 2.5 per cent at the end of 2003. These cuts were compatible with the impressive outcome that the inflation target of 2.5 per cent was achieved in that year. The next turn in the policy stance occurred in 2004, when inflation accelerated mainly as the result of supply shocks. These led to hikes in the interest rate up to 3 per cent towards the end of 2004, a level that was maintained during the first half of 2005.

The gradual hike of the policy rate to 3.8 per cent by the end of 2002 was certainly influenced by the nominal exchange rate depreciation that resulted from pressures caused by the uncertainty about elections in Brazil. That was about the only time when the authorities sold foreign exchange out of their reserves, in an attempt to lean against the wind. The interest rate hikes appear to have had some impact on capital inflows in the second half of 2004. Notwithstanding persistent intervention by the authorities, a nominal exchange rate appreciation was then observed (Figure 5.2).

In sum, a casual look at Peru's conduct of monetary policy exhibits patterns typical of any other standard (i.e., non-dollarized) economies. The policy rate was changed from time to time based on the forward-looking inflation outlook and

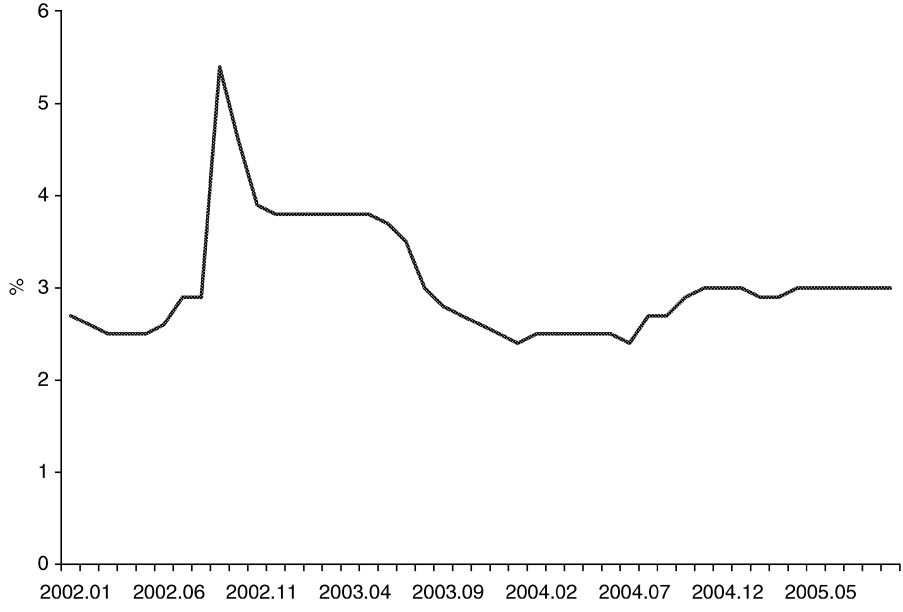

Figure 5.1 Peru: interbank rate, 2002–5

Source: Central Reserve Bank of Peru (BCRP).

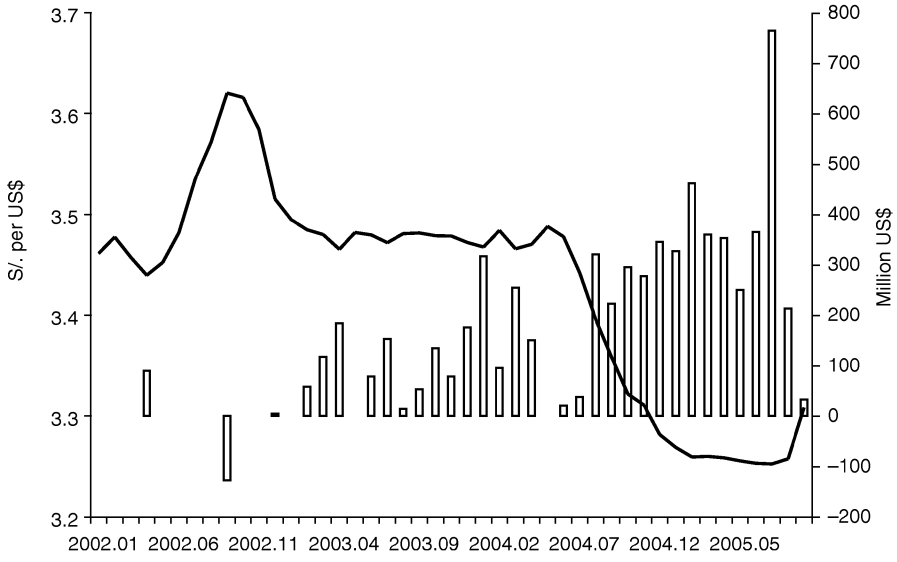

Figure 5.2 Peru: exchange rate and BCRP intervention, 2002–5
Source: BCRP.

these changes were implemented in a gradual, serially correlated manner. Having said that, it is remarkable how small the degree of interest rate variability has been, compared with other IT countries such as Chile or Israel. The policy rate varied from a high of 3.8 per cent to a low of 2.5 per cent. At the same time, nominal exchange rate variability has also been relatively low, partly reflecting the impact of abundant foreign exchange market intervention. The gap between the most depreciated level of the nominal exchange rate, in the second half of 2002, and its most appreciated value, in mid-2005, is only 11 per cent. These features suggest that FFIT in Peru, while quite successful overall, remains characterized by substantial fear of floating. The latter, in turn, is likely to reflect the high dollarization.

Bolivia's recent monetary experience is also worth reviewing. Unlike Peru, Bolivia has been unable so far to let its exchange rate float. Perhaps in part due to credibility concerns, the monetary authorities have continued to consistently target the exchange rate through a slowly adjusting crawl that informally targets the multilateral real exchange rate, subject to inflation remaining low.[7] In the wake of the switch to floating rate regimes in Bolivia's large neighbouring countries, notably Brazil and Argentina, and the large subsequent depreciations of their currencies vis-à-vis the dollar, Bolivia faced a strong appreciation of its real effective exchange rate. To fend off the resulting pressures on Bolivia's trade and economic activity, the monetary authorities acted countercyclically, by accelerating the rate of crawl. This policy has been seemingly successful in maintaining a competitive exchange rate (albeit with some lag). Although rising in recent years, inflation has remained moderate (Figure 5.3).

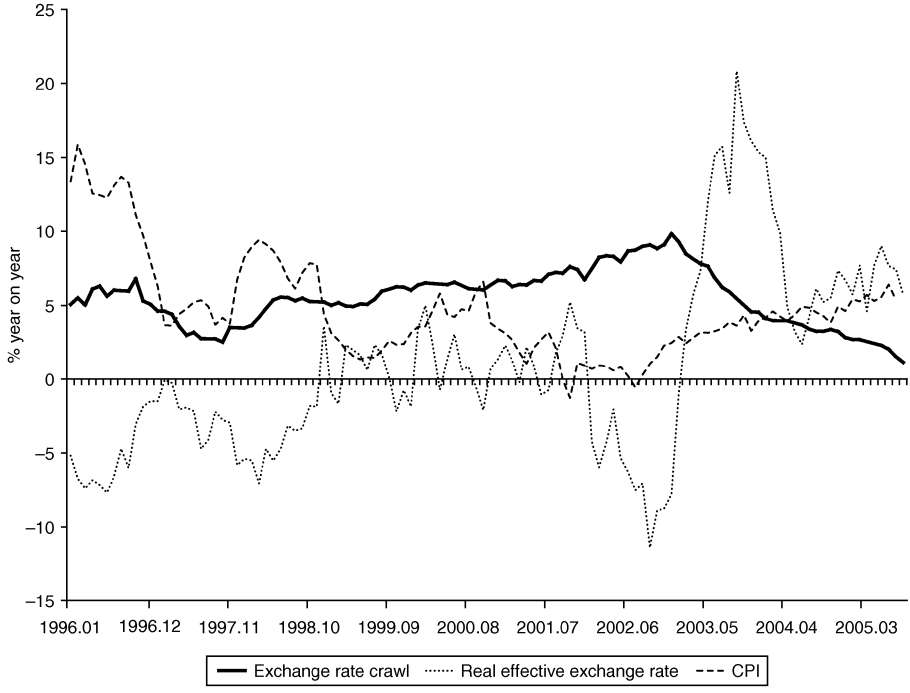

Figure 5.3 Bolivia: exchange rate crawl, inflation and real effective exchange rate, 1996–2005[1]

Source: IFS and Central Bank of Bolivia (BCB).

Note: 1. An increase in the REER reflects a depreciation.

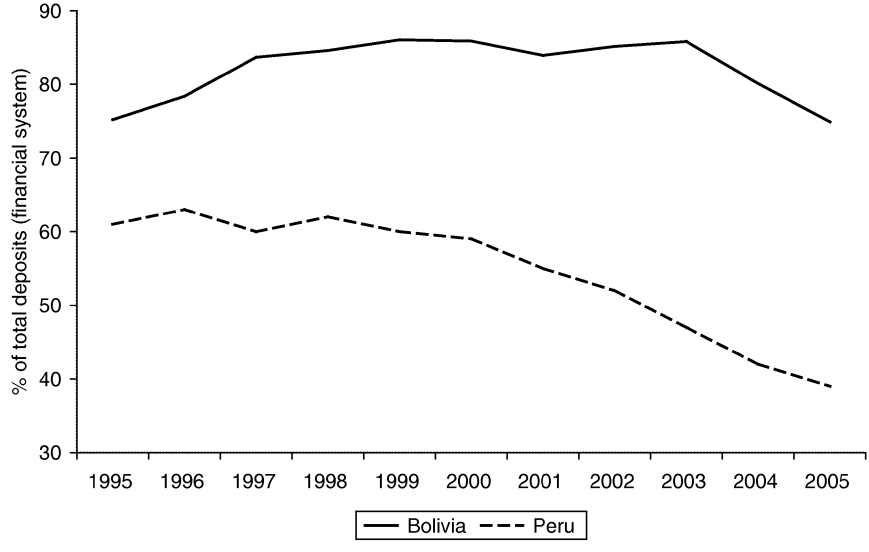

Figure 5.4 Bolivia and Peru: financial dollarization (per cent of total deposits)

Source: BCB and BCRP.

However, a main potential drawback of the FFCT regime (in addition to the delayed exchange rate adjustments) is that the close targeting of the exchange rate tends to promote dollarization. Instead, FFIT should tend to reduce dollarization.[8] While we have not conducted formal tests of such linkages, the much stronger decline in dollarization in Peru than in Bolivia, following the adoption in Peru of the FFIT regime, is consistent with this hypothesis (Figure 5.4).

5.4 Monetary policy transmission

The recent declining trend of inflation in most of the less developed economies is closely related to changes in the exchange rate. While this is likely to be also the case for Chile and Peru, there are clear differences in how inflation has become more stable in the two countries. There are many other open questions that still remain in this regard. How has the exchange rate pass-through evolved in these countries? To what extent is dollarization associated with lower monetary control and higher financial vulnerability? Has inflation targeting allowed greater control over inflation?

To address these questions, we use VAR models to characterize monetary policy and analyze the impact of the exchange rate on inflation in both countries. We find that Peru registers a much higher pass-through on average than Chile. However, the pass-through in Peru has diminished together with the implementation of FFIT. Second, we find that while exchange rate shocks had a significant impact on the rate of inflation under the FFCT regime, interest rate shocks have tended to dominate exchange rate disturbances under FFIT. Finally, we find evidence of Granger causality from the real bilateral exchange rate to NPLs in Peru, but not in Chile.

Exchange rate pass-through

Using a baseline vector autoregressive (VAR), which considers seven variables,[9] we estimate the effect of the nominal exchange rate in both countries considering our complete monthly sample, from 1993:01 to 2005:07, that covers both the FFIT and IIT periods. Figures 5.5a and 5.5b show the impulse-response functions for Chile and Peru, respectively. There is clear evidence that Chile has a much lower pass-through than Peru. In particular, the Chilean pass-through is low and very short-lived (around six quarters), while Peru registers a much higher pass-through that takes more than two years to die out.

However, the pass-through declined as Peru switched from IIT to FFIT. Using the same baseline VAR, we compare the transmission mechanism before and after implementation of the FFIT framework. We run two VAR models: one from 1993:01 to 1998:12 and a second from 1999:01 to 2005:07. The 1999 threshold is taken to match differences in the behaviour of the real exchange rate. We did not split the data from 2002 – the year that IT was implemented – because there are not enough observations to run sensible regressions. However, the second sample is clearly influenced by the FFIT regime.

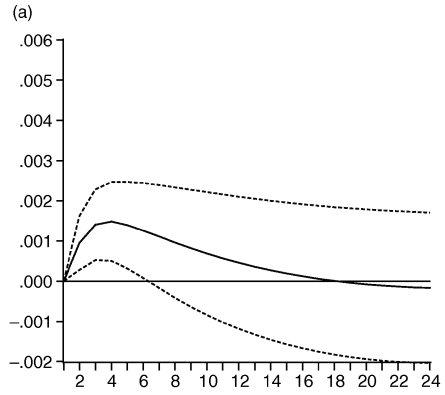

Figure 5.5a Chile: response of inflation to one SD nominal exchange rate innovation, 1993:01–2005:07

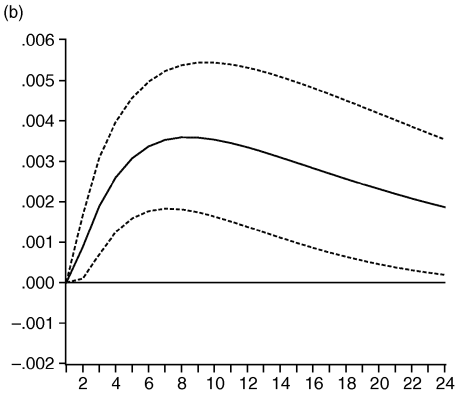

Figure 5.5b Peru: response of inflation to one SD nominal exchange rate innovation, 1993:01–2005:07

Source: Authors' calculations.

Figures 5.6a and 5.6b show the two samples' impulse-response functions of inflation for three types of shocks: interest rate, money and the nominal exchange rate. The results are consistent with what one would expect. In particular, in the first sample, exchange rate and monetary shocks have a significant impact on inflation, whereas interest rates shocks do not. The reverse is true during the second period. This clearly suggests that the monetary transmission is endogenous to the policy regime. Unsurprisingly, the variable that is chosen as the key policy target becomes less volatile and becomes more relevant in terms of transmitting monetary signals.

Interest rate pass-through

As a complementary exercise, we focus our attention on the transmission from policy rates to banking rates for Peru, using the previous samples. We find that in the first sample, the interbank rate Granger causes the policy rate while the opposite does not hold. Instead, the one-way causality is missing between these rates in the second sample (Table 5.3). This suggests that the central bank has gained credibility in influencing market rates.

Financial stress

Reflecting balance sheet effects, higher dollarization should trigger a closer association between exchange rate fluctuations and non-performing loans. Figures 5.7a and 5.7b display the evolution of the real exchange rate and non-performing loans in Chile and Peru, respectively. From the figures we can observe that there is some relationship between the two series in both countries.

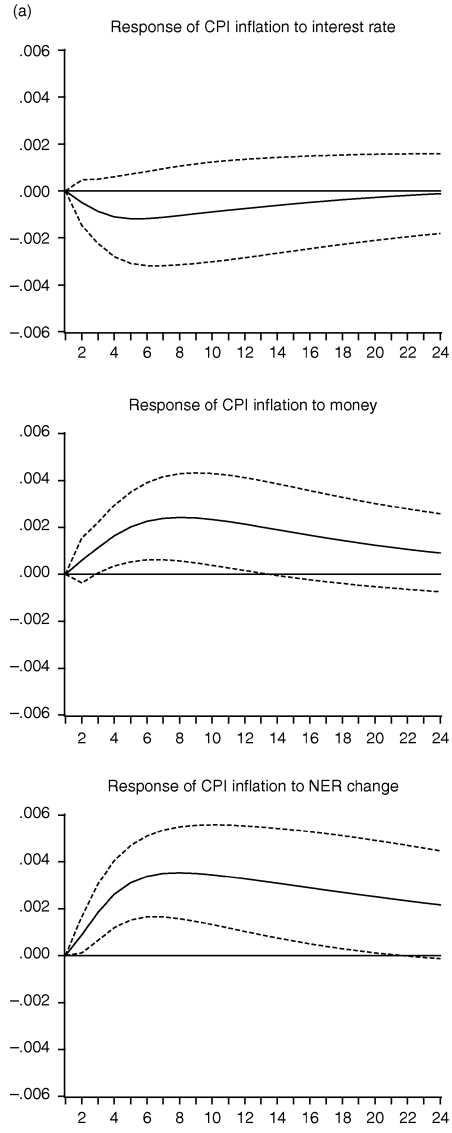

Figure 5.6a Peru: response to one SD innovation ±2 SE, 1993:01–1998:12

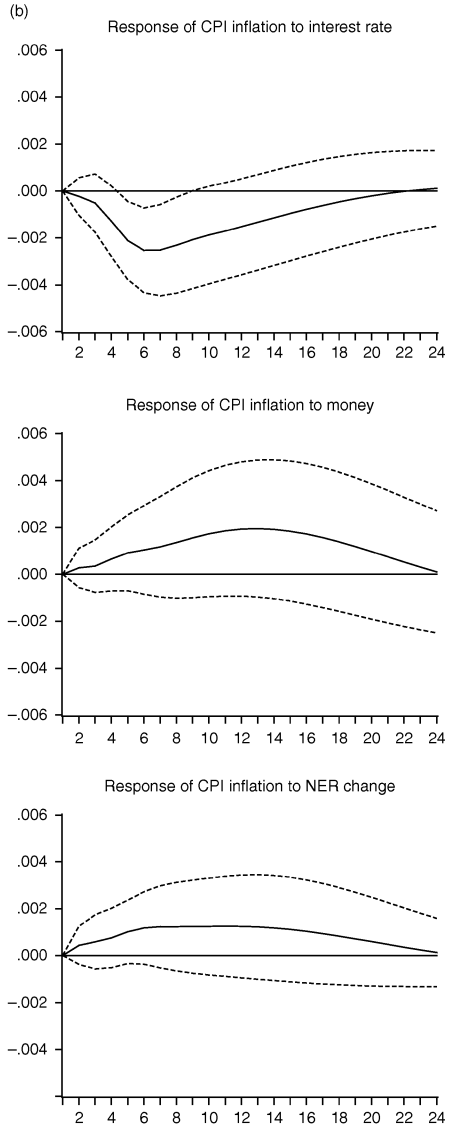

Figure 5.6b Peru: response to one SD innovation ±2 SE, 1999:01–2005:07

Source: Authors' calculations.

However, it is not possible to tell whether there is a causal relationship. Using a bivariate VAR model and two different sub-samples (1994:03–2004:12 and 1999:01–2004:12), we find evidence of Granger causality from the real bilateral exchange rate to NPLs in Peru, but not in Chile (see Figures 5.8a and

Table 5.3 Peru, Granger causality: BCRP rate vs. banking interest rates

Null hypothesis	Observations	F-statistic	Probability
Period: 1993:01–2004:12			
Interbank rate does not Granger cause BCRP rate	100	7.94	0.00
BCRP rate does not Granger cause interbank rate		1.68	0.19
Active rate does not Granger cause BCRP rate	142	0.80	0.45
BCRP rate does not Granger cause active rate		9.00	0.00
Passive rate does not Granger cause BCRP rate	142	5.27	0.01
BCRP rate does not Granger cause passive rate		7.34	0.00
Passive rate does not Granger cause active rate	142	3.45	0.03
Active rate does not Granger cause passive rate		1.02	0.36
Period: 1999:01–2004:12			
Interbank rate does not Granger cause BCRP rate	63	8.43	0.00
BCRP rate does not Granger cause interbank rate		2.91	0.06
Active rate does not Granger cause BCRP rate	72	4.58	0.01
BCRP rate does not Granger cause active rate		2.99	0.06
Passive rate does not Granger cause BCRP rate	72	11.17	0.00
BCRP rate does not Granger cause passive rate		8.20	0.00
Passive rate does not Granger cause active rate	72	7.26	0.00
Active rate does not Granger cause passive rate		2.05	0.14

Source: Authors' calculations.

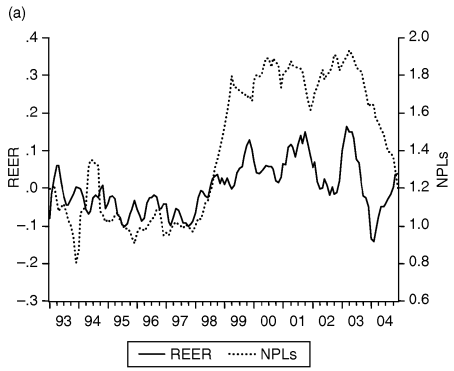

Figure 5.7a Chile: real effective exchange rate (year on year) and NPLs, 1993–2004

Sources: BCCH, BCRP, SBIF, SBS, and authors' calculations.

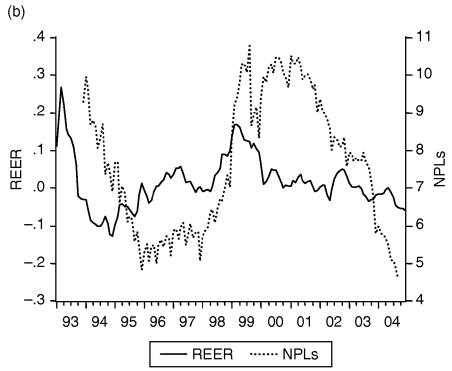

Figure 5.7b Peru: real effective exchange rate (year on year) and NPLs, 1993–2004

5.8b). This is consistent with the former country being more dollarized than the latter. In Peru, real exchange rate shocks have a significant impact on NPLs from the fifth month and persist for around one quarter, with no significant differences between the two sub-samples.

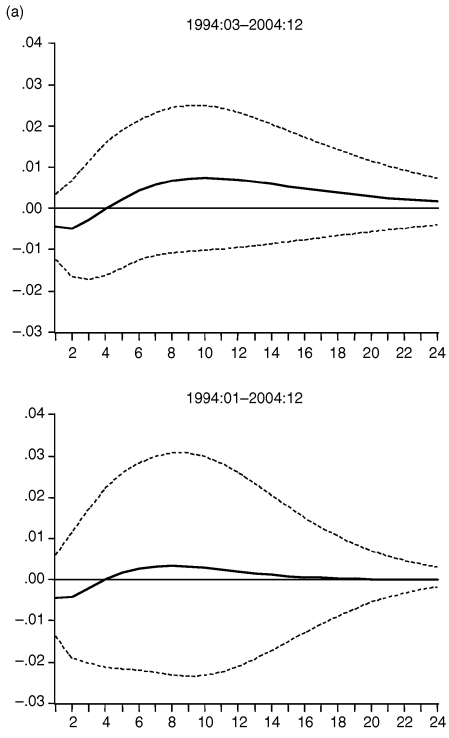

Figure 5.8a Chile: response of NPLs to one SD REER innovation

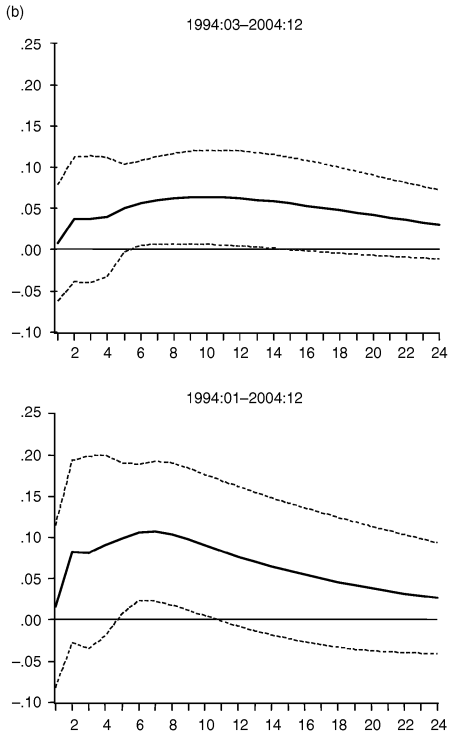

Figure 5.8b Peru: response of NPLs to one SD REER innovation

Source: Authors' calculations.

5.5 Reaction functions

We now turn to examine in more detail to what extent dollarization has affected in recent years the formulation of monetary policy in the four Latin American countries in our sample. The baseline reaction functions comprise those typically used for open economies. The short-term nominal interest rate (i) reacts to: (i) the actual inflation rate gap (π); (ii) the output gap (y); (iii) the US Federal Fund rate (*FF*), to account for interest rate parity; (iv) net international reserves (*NIR*), to gauge the reaction to reserve losses; and (v) the real effective exchange rate (*REER*), to take into consideration competitiveness targeting. Thus, the specification is the following:

$$i_t = \alpha + \beta\pi_t + \delta y_t + \phi\Delta REER_t + \eta\Delta NIR_t + \kappa FF + \gamma i_{t-1} + \varepsilon_t, \quad (1)$$

where Δ is the first difference operator. In the case of Bolivia, the dependent variable is the rate of crawl (*Crawl*), rather than the interest rate, reflecting the fact

Table 5.4 Reaction functions (based on GMM), 1993–2005[1]

Using the interest rate as operational instrument

Country	α	π_t	y_t	$\Delta REER_t$	ΔNIR_t	FF_t	i_{t-1}	R^2	*J*-statistic
Chile	0.52	0.75	0.00	0.00	0.04	0.08	0.46	0.78	0.30
	(0.67)	(2.10)	(0.09)	(1.87)	(0.90)	(2.17)	(2.02)		
Colombia	−0.96	0.82	0.01	−0.31	0.62	0.01	0.51	0.88	0.05
	(−0.91)	(3.23)	(1.67)	(−3.24)	(1.54)	(1.88)	(1.04)		
Peru	−0.88	0.53	−0.38	−0.00	−0.32	−0.09	0.77	0.97	0.20
	(−0.05)	(3.08)	(−1.55)	(−1.17)	(1.96)	(−0.99)	(4.06)		

Using the rate of crawl as operational instrument

Country	α	π_t	y_t	$\Delta REER_t$	ΔNIR_t	FF_t	$Crawl_{t-1}$	R^2	*J*-statistic
Bolivia	0.03	−0.51	−0.41	−0.20	−0.27	−0.02	0.72	0.83	0.01
	(1.87)	(−5.90)	(−4.00)	−(1.99)	(−1.74)	(−1.70)	(5.04)		

1. *t*-statistics appear in parentheses. Optimal weighting matrix obtained from first-step two-stage least squares parameter estimates. Instruments: lagged values of inflation, estimates of output gap and changes in real exchange rates.

that the exchange rate is not allowed to float.[10] The results (see Table 5.4) are based on the GMM technique which provides better results when simultaneity and endogeneity become a problem.[11]

Several interesting results emerge.[12] First, the strong significance and signs of the inflation coefficient indicates that all central banks, even Bolivia, try to control it. While an increase in inflation leads to higher interest rates in Chile, Colombia and Peru, in Bolivia it leads to a *slowing down* of the rate of crawl.

Second, the coefficients associated with the output gap are weakly significant for Colombia and Peru. However, in the latter case it is wrongly signed, possibly reflecting the dominance of confidence shocks that simultaneously raise the risk premium and depress output through a decline in aggregate demand. Interestingly enough, the output coefficient is strongly significant in the case of Bolivia, confirming that the monetary authorities have used monetary policy for countercyclical purposes, as indeed has been the case during the last few years.

Third, the coefficients associated with changes in the real exchange rate are significant for Bolivia and Colombia. In view of its expansionary impact, an exchange rate depreciation leads to a decline in interest rates in Colombia and a slowing down of the rate of crawl in Bolivia.

Fourth, both the Peruvian and the Bolivian monetary authorities react to changes in their international reserves. A reserve loss leads to counteracting increases in the policy interest rate in Peru and the rate of crawl in Bolivia. This suggests that both countries use their international reserves as front-line buffers against shocks and adjust their monetary policy to replenish their reserves once they have been used.

All in all, the evidence therefore supports classifying Chile as an FFIT country, where inflation control is the only key target for monetary policy. While inflation control is also the main policy target in Colombia, concerns about the real exchange rate also appear to be relevant, suggesting that there might exist some element of competitiveness targeting as well. In the case of Peru and Bolivia, the fact that they mould their monetary policy, to some extent, around a more active use of their international reserves is consistent with a concern for limiting the potentially damaging impact of large exchange rate fluctuations in a highly dollarized environment. In the case of Peru, which does allow its exchange rate to float, this would suggest classifying it as an IIT country. In the case of Bolivia, the importance of international reserves and the real exchange rate in monetary policy, together with the fact that it operates through a crawl, make it a natural FFCT candidate. It is important to note, however, that inflation also appears to have been an important concern for the Bolivian monetary authorities. It is also rather remarkable that Bolivia appears to be the country with the most countercyclical monetary policy.

5.6 Concluding remarks

Since our main conclusions from this research were summarized in the Introduction, we now turn to some avenues for future work and some policy implications.

As far as the analytical framework is concerned, the challenge for future work is to develop simple models of IT that fully incorporate some of the special features that arise under financial dollarization, such as contractionary devaluations due to balance sheet effects and the wide use of direct foreign exchange market intervention. From a policy perspective, one would need to consider models in which the monetary authority has two instruments to respond to various fluctuations: the policy interest rate and direct foreign exchange market intervention. Accordingly, when facing, for example a sudden stop, the authorities may spread the burden of the monetary adjustment between interest rate hikes and selling foreign currencies. As far as we know, these trade-offs have not been discussed in previous IT work.

We believe there are important ways for improving the transparency of monetary policy in dollarized IT economies. Given the key role of financial system fragility in these economies, and the wide use of foreign exchange market intervention as a policy instrument, it would seem reasonable to expect central banks to communicate to the public their assessments, evidence and policy strategy in these areas. A quick look at existing inflation reports indicates that there is scope for improvement here.

Another policy theme has to do with de-dollarization as a means of improving the efficacy of monetary policy. In most emerging market economies, de-dollarization typically occurs as an endogenous phenomenon, along with a marked reduction in the rate of inflation and not as a result of active and direct policies with that objective. Yet, the experience of countries such as Chile and Israel suggests that

policy-makers can also have a direct role in this process by contributing to the development and deepening of domestic financial markets. For example, the growing presence of medium- and long-term bonds denominated in domestic currency is a remarkable phenomenon. Other useful policy (institution-building) steps have to do with helping develop markets in financial instruments to hedge foreign exchange risk. These can be expected to attenuate the 'fear of floating' phenomenon. These are key policy issues that need to be addressed in future work.

Notes

1. We thank Alain Ize, Eduardo Levy Yeyati, Klaus Schmidt-Hebbel and participants at the April 2005 Lima conference for their valuable comments. We also appreciate the editing comments provided by Graham Colin-Jones. The usual disclaimer applies.
2. For recent references on the issue, see Mishkin and Schmidt-Hebbel (2005) and Batini and Laxton (2005).
3. See Calvo (1999; 2001), Krugman (1999), Stein *et al.* (1999) and Aghion, Bachetta and Banerjee (2000), among others.
4. See, for example, the papers that started this discussion: Calvo and Reinhart (2002) and Stein *et al.* (1999).
5. Our special thanks to Alain Ize who provided this useful categorization during the review process.
6. See also Armas and Grippa, Chapter 6 of this volume.
7. See Morales (2005).
8. Ize and Levy Yeyati (2003) show that financial dollarization should be related to the ratio of the volatilities of inflation and real exchange rate.
9. The variables considered in the baseline model are (in the same order in the VAR): world oil price, foreign interest rate, seasonally adjusted GDP, inflation, domestic (policy) interest rate, money and the nominal exchange rate.
10. This specific policy setting was empirically proposed and implemented by Parrado (2004).
11. See Clarida, Galí and Gertler (1998).
12. The tests show that there are no problems of autocorrelation and that the equation set-up explains around 90 per cent of actual movements of interest rates.

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6

Inflation Targeting in a Dollarized Economy: The Peruvian Experience

Adrián Armas and Francisco Grippa[1]

6.1 Introduction

The theoretical and policy literatures have little to say on the conduct of monetary and exchange rate policy in a dual-currency economy. While some financially dollarized economies have nonetheless recently moved from hard pegs to more flexible exchange rate regimes, questions remain regarding the effectiveness of monetary policy in such economies, how to deal with financial dollarization risks and how to restore long-run confidence in the domestic currency.

Inflation targeting has become popular among several emerging market economies, especially since the end of the past decade. It stresses the central bank's explicit and permanent commitment to price stability. If this commitment is credible, it anchors expected inflation at the target level, thereby enhancing the effectiveness of monetary policy and strengthening the role of the domestic currency as a store of value.

On this basis, since 2002 the BCRP has pursued a monetary policy based on inflation targeting. To date, this is the only known case of a highly financially dollarized economy that has adopted such a framework.

Although financial dollarization has been steadily declining in Peru in the last few years, it remains significant. By the end of 2004, 55 per cent of broad money and more than 70 per cent of credit to the private sector were denominated in foreign currency. Financial dollarization must therefore be taken into consideration when designing and implementing monetary policy, both to control its inherent risks and to promote the domestic currency.

Reinhart, Rogoff and Savastano (2003) study a sample of partially dollarized economies (including Peru) and find that dollarization does not necessarily prevent monetary policy from bringing inflation under control. Nonetheless, compared with an environment without dollarization, the design and implementation of inflation targeting in a financially dollarized economy such as Peru differ in several ways. The differences have to do with the inflation forecasting system and the BCRP's responses for dealing with financial dollarization risks.

As regards the inflation target, the BCRP has set a level that is lower than that in other inflation-targeting countries in Latin America. These countries have annual inflation targets that range from 3 per cent to 6.5 per cent, while Peru's target is 2.5 per cent (with a maximum tolerated deviation of 1 percentage point above and below the target). With such a low inflation target, similar to long-run inflation in the United States, the domestic currency is in a better position to compete against the US dollar.

As regards the operational target, it was changed from bank reserves to an interest rate target. The benefits of using an interest rate target were compounded in Peru by the fact that the increased stability and predictability of the short-term interest rate in domestic currency helps to de-dollarize the economy. Together with the recent development of a benchmark yield curve for public debt in domestic currency, this has facilitated the issuance of long-term financial instruments by the private sector. In turn, the reduction in financial dollarization has reduced the vulnerability of the economy to balance sheet effects triggered by large domestic currency depreciations.

Although the BCRP's inflation forecasting system is similar to those of other inflation-targeting central banks, there are some important differences. In particular, the investment-savings (IS) equation takes into consideration the possible effects of financial dollarization through aggregate demand. It allows for the presence of both the foreign and domestic currency interest rates, and incorporates not only the standard (multilateral) real exchange rate-net exports link, but also the balance sheet effect associated with sol-dollar exchange rate fluctuations. In view of the BCRP's aim of moderating excessive exchange rate volatility, there is also an inertia term in the exchange rate equation.

Dollarized economies are financially more vulnerable, due to both currency-induced credit risk and liquidity risk. The private non-financial sector's income is basically denominated in domestic currency, yet its debts are in foreign currency. Thus, an unexpected large domestic currency depreciation may undermine the solvency of this sector, thereby increasing the financial sector's credit risk. On the other hand, the financial sector itself has a maturity mismatch in that it has short-term liabilities in foreign currency but assets in the same currency that have a longer average maturity. Although this type of liquidity risk is common to banking systems, the risk in a financially dollarized economy is higher because the central bank does not issue foreign currency.

To deal with these risks, the BCRP promotes voluntary financial de-dollarization and encourages economic agents to internalize financial dollarization risks. At the same time, it limits balance sheet effects by moderating the volatility of the exchange rate. It also aims at maintaining sufficient availability of liquid funds in foreign currency by requiring that commercial banks hold large liquid reserves against their foreign currency liabilities, and by maintaining a high level of international reserves at the BCRP.

Section 6.2 outlines how the BCRP has taken into consideration financial dollarization in the design of monetary policy. Section 6.3 deals with monetary policy implementation. Section 6.4 describes the central bank's strategy for controlling financial dollarization risks. Section 6.5 concludes.

6.2 Inflation targeting under financial dollarization

The BCRP used a monetary-targeting framework during the 1991–2001 disinflation process.[2] However, in the new low-inflation environment, base money growth rate has become more unpredictable and is no longer suitable for communicating the stance of monetary policy.[3] As a result, and given its autonomy and operational independence, the BCRP adopted inflation targeting in 2002.[4] Monetary policy decisions are reflected in changes in the BCRP's operational target. Since 2001, the timing of monetary policy meetings is made public at the beginning of the year, and policy decisions are announced immediately after each meeting.

The inflation target

As seen in Table 6.1, the characteristics of the inflation target in Peru are largely the same as in other countries that have reached and maintain a low inflation rate, consistent with their long-run inflation target level. Countries that are undergoing a disinflation process (Brazil, Colombia and the Philippines) maintain their inflation targets for one or two years. Countries that have already reached low inflation maintain their target indefinitely at that level (for the medium term). The inflation target level in the latter group of countries is between 2 and 3 per cent. Once the long-run inflation target has been reached, central banks usually stop revising the target. This is a signal of stability for long-run savings and investment decisions.

Chile and Peru ended their disinflation processes at least three years ago.[5] Both countries have now reached an inflation rate that is consistent with their long-run inflation targets. The Peruvian inflation target of 2.5 per cent is similar to the average US inflation rate in the past 90 years, is the lowest in Latin America and is also the lowest level recorded for the Peruvian economy since the 1930s (Table 6.2).

Given Peru's high dollarization, the low inflation target reflects the BCRP's need to demonstrate a strong commitment to strict inflation control. By keeping the

Table 6.1 Inflation targets in some inflation-targeting countries

Country	Inflation target	Target's horizon
Australia	2% to 3% (since 1993)	Medium term
Brazil	5.1% (for 2005)	1 year
Canada	1% to 3% (since 1998)	Medium term
Chile	2% to 4% (since 2001)	Medium term
Colombia	4.5% to 5.5% (since 2005)	1 year
Czech Republic	2% to 4% (since 2005)	Medium term
Mexico	2% to 4% (since 2004)	Medium term
Norway	1.5% to 3.5% (since 2001)	Medium term
Peru	**1.5% to 3.5% (since 2002)**	**Medium term**
Philippines	4% to 5% (for 2004–5)	2 years
Poland	1.5% to 3.5% (since 2004)	Medium term
Sweden	1% to 3% (since 1995)	Medium term
United Kingdom	2%	Medium term

Source: Central bank websites.

Table 6.2 Peru: average annual inflation rates, 1900–2004

Period	Inflation
1901–5	6.1
1906–10	−2.0
1911–15	1.2
1916–20	13.4
1921–5	−1.0
1926–30	−3.3
1931–5	−2.1
1936–40	3.9
1941–5	11.2
1946–50	18.9
1951–5	7.2
1956–60	8.4
1961–5	8.9
1966–70	9.7
1971–5	12.6
1976–80	50.6
1981–5	102.1
1986–90	823.8
1991–5	78.4
1996–2000	6.9
2001–4	2.0

Source: BCRP.

domestic currency's long-term purchasing power at par with that of the dollar, this commitment helps the domestic currency compete against the dollar and should help reduce real and payments dollarization.[6] While it could be argued that too low an inflation target could be less credible, as shown below both the short- and medium-term inflation expectations are well within the target's level.

The operational target

The evolution of the operational target is summarized in Figure 6.1. It was changed from a monetary target to an interest rate target when inflation targeting was formally adopted in 2002. The use of an interest rate target is more in accordance with the inflation-targeting framework goal, as well as with the need to reduce financial dollarization. Reflecting the fact that daily monetary operations are now oriented towards stabilizing the policy interest rate announced by the BCRP, the volatility of the interbank overnight interest rate has decreased and the interest rate pass-through has strengthened.

One of the advantages of using an interest rate target is that the stance of monetary policy can be communicated to the public in a clear and simple way. Because the stance can be easily understood, monetary policy is more effective and powerful.[7] For example, a reduction of the interest rate target level indicates to the public that the BCRP has eased its monetary policy stance, and vice versa.

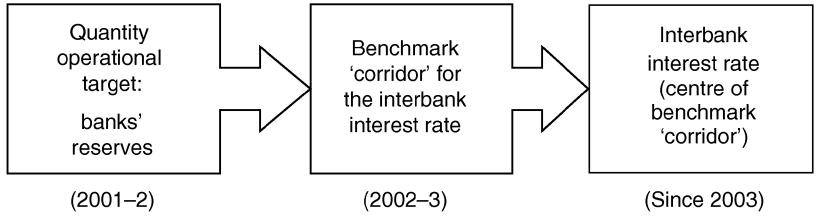

Figure 6.1 Evolution of the operational target interest rate

A second advantage is that, by making the short-term interest rate more stable and predictable, it helps to develop a yield curve for interest rates at different maturities. In the absence of a stable and predictable short-term interest rate, the market lacks a benchmark on risk premia for setting up interest rates at longer maturities. When this happens, there are no long-term operations in domestic currency, or their interest rates are the same as for similar operations in foreign currency plus the expected depreciation of the domestic currency. In the latter case, domestic currency interest rates would tend to follow closely the foreign currency interest rates and the expected future depreciation of the local currency (as in a pegged exchange rate regime).

The use of an interest rate operational target was not desirable at the beginning of the 1990s, when the disinflation process in Peru began. Under the hyperinflation environment, it was easier to communicate the stance of monetary policy with a monetary target: the gradual reduction of base money growth rate was a good indicator of the monetary authorities' commitment to disinflation. Moreover, in view of the high level and variability of expected inflation, the resulting volatility of the interest rate would have been confusing and potentially destabilizing.

In a low-inflation environment, however, monetary targets are less helpful because monetary aggregates tend to be loosely correlated with inflation in the short run. Moreover, it is difficult to communicate the policy stance because changes in the monetary target might be due to expected changes in money demand. In addition, by increasing the volatility of the short-term interest rate in local currency, a monetary target penalizes the development of the capital market in domestic currency. Given that inflation was already low when inflation targeting was adopted (actually it was around 0 in 2001) and that the interbank overnight interest rate was very volatile (its standard deviation in 2001 was close to 1 percentage point), it thus seemed reasonable to gradually shift the operational target from a monetary aggregate to the interbank overnight interest rate.[8]

Current BCRP operational procedure targets the interbank overnight interest rate. The rate on the injection standing facility acts as a ceiling, while the overnight deposits interest rate acts as the floor of the 'corridor' for the interbank interest rate. While this operational procedure was put in practice in 2002, the emphasis on the centre of the corridor dates from 2003.

During this process of adjustment, interbank interest rate volatility has been steadily reduced (Table 6.3). The current variability of this interest rate is low and comparable to that of other central banks with a similar operational target. Indeed,

Table 6.3 Peru: interbank interest rate (percentage points)

Year	Average	Standard deviation
1998	18.7	6.45
1999	15.0	4.72
2000	12.6	2.67
2001	9.0	0.91
2002	3.2	0.48
2003	3.4	0.09
2004	2.7	0.07

Source: BCRP.

in 2004, the standard deviation of the interbank interest rate was 7 basis points, while that of the US Federal Funds rate was 4 basis points. The reduction in interbank overnight interest rate variability has made monetary policy more predictable, significantly strengthening the impact of changes in this interest rate on other interest rates in domestic currency.

Lahura (2005) estimates the interest rate pass-through from changes in the interbank overnight interest rate to interest rates on loans and deposits. He analyzes the effect of inflation targeting on the pass-through and finds that since 2001, with the announcement of the operational target and the adoption of inflation targeting, the pass-through has significantly increased (see Figure 6.2; the shaded area is the inflation-targeting period). Before the announcement of the operational target in 2001, the pass-through was statistically different from zero for just two of the seven interest rates considered. Since the announcement of the operational target, it began to increase in all of seven cases considered: at the end of 2004, it was greater than 0.5.

However, a key feature in the design of the operational target in a dollarized economy is how this target can be used to manage a large domestic currency depreciation. This is important because large exchange rate movements may be harmful for economic activity in Peru, given financial dollarization (see Carranza, Cayo and Galdón-Sánchez [2003] for a discussion on the balance sheet effect in Peru). The monetary target allowed the BCRP to limit the impact of a shock on the exchange rate by enabling the interest rate to also act as a buffer (part of the shock could also be absorbed through forex interventions). This was the case in the second part of the 1990s, when the Peruvian economy was successively hit by significant negative shocks (Asia in 1997, Russia in 1998 and Brazil in 1999).

The current interest rate target maintains this possibility for extreme situations, in which rapid and substantial increases in the interbank interest rate are needed to limit the currency depreciation and prevent balance sheet effect from undermining economic activity and the solvency of the financial system. Instead, the impact of large adverse shocks is spread out between the overnight interest rate and the exchange rate. Thus far, this has been put into practice only once, in September 2002 (Figure 6.3).

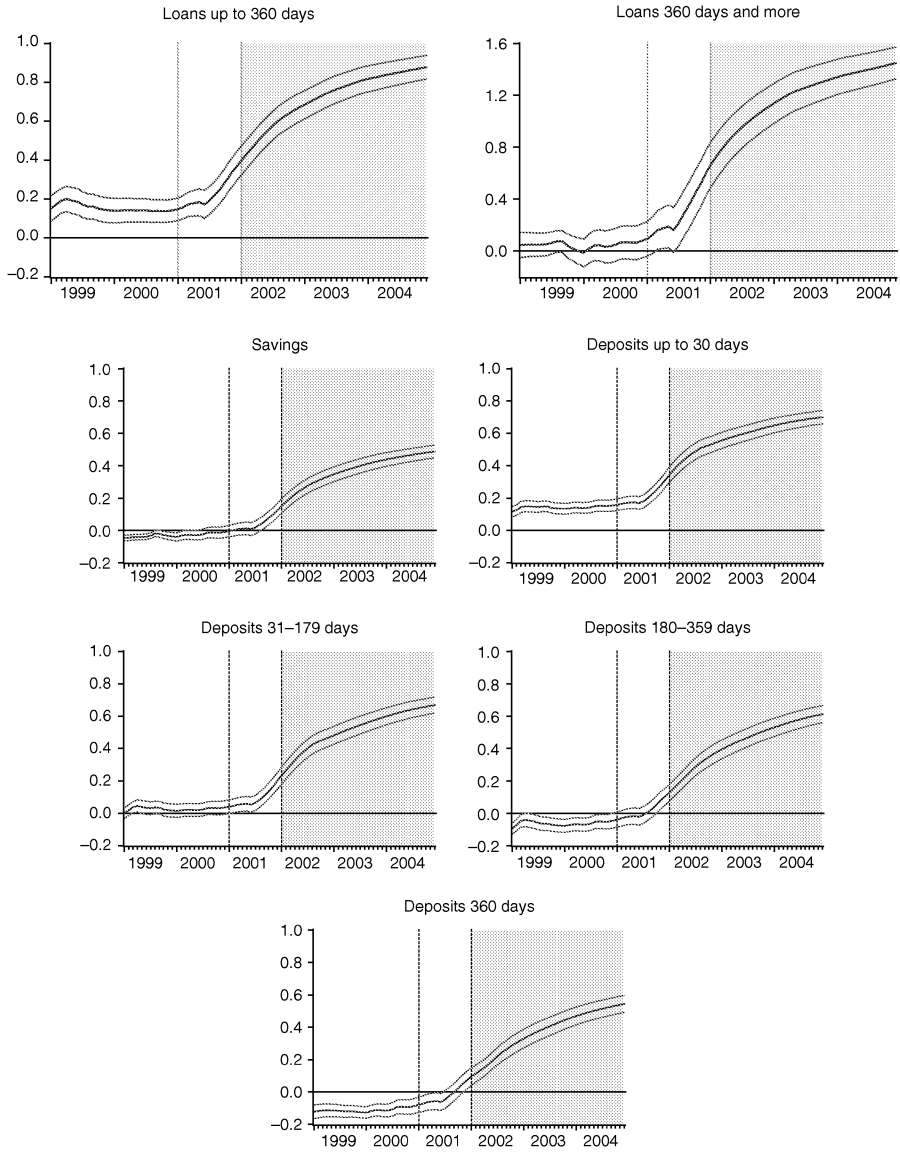

Figure 6.2 Interest rate pass-through by loan type, 1999–2004
Source: BCRP.

6.3 Monetary policy implementation under financial dollarization

The implementation of monetary policy in Peru takes into account financial dollarization and its effects on the economy. As any other inflation-targeting

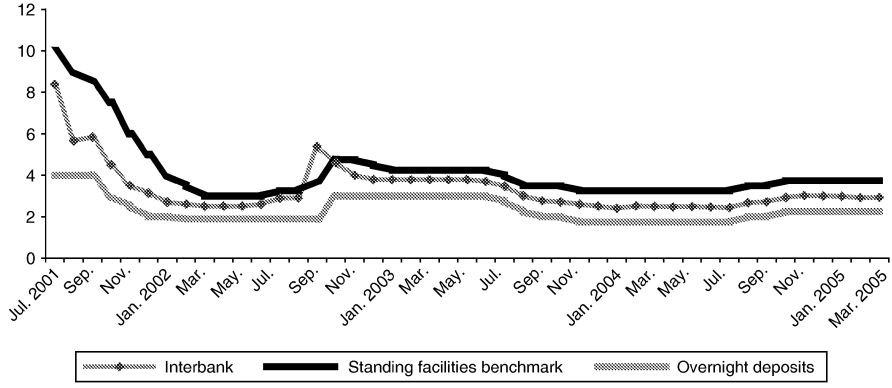

Figure 6.3 Interbank, benchmark (ceiling) and overnight deposits (floor) interest rates (percentage points)

Source: BCRP.

central bank, the BCRP uses an inflation forecasting system to anticipate future inflation pressures and take measures to counteract them. In addition, however, the BCRP also implements some policies to deal with financial dollarization risks. This section focuses on the inflation forecasting system and how it accounts for the presence of financial dollarization and its effects on the economy. Control of financial dollarization risks is discussed in the next section.

The inflation forecasting system

The principal inflation forecasting tool is the quarterly projection model (QPM).[9] The model assumes that monetary, foreign exchange and financial markets are not under stress. Otherwise non-linearities, which are not considered in the standard forecasting process, might appear. It is a standard semi-structural calibrated model. Because there are few data available for a low-inflation environment in the Peruvian economy, special consideration is put on the calibration of the QPM parameters, which are continuously assessed.

The model analyzes dynamics around trends, which are interpreted as short-term equilibria. It thus focuses on a flow analysis (variables are expressed as deviations from trends or as rates of growth), and restrictions are imposed to ensure the long-run neutrality of nominal variables and to guarantee inflation convergence towards the target. The model has four main blocks: a Phillips curve, an IS curve, an exchange rate equation and a monetary policy rule.

Aggregate supply (Phillips curve)

The Phillips curve models core inflation dynamics. The right-hand side of the equation incorporates: (i) demand factors (output gap); (ii) expected future inflation; (iii) imported inflation; and (iv) core inflation inertia. Central bank specialists forecast supply factors and non-core inflation components. This is done by anticipating future weather conditions, assessing information about crops and food

supply, tax arrangements, regulated prices (public tariffs), the recent evolution of input prices and short-term demand indicators and considering seasonality. The lag with which monetary policy actions affect inflation is estimated to be around only one year (Armas, Grippa and Quispe, 2001), below the lags generally found in countries with more developed financial systems and a longer record of low inflation (two years or more).

The effect of a domestic currency depreciation on inflation is captured by the imported inflation term. The QPM has a relatively low exchange rate-to-prices pass-through: a 1 per cent transitory increase in the exchange rate (sol/dollar) causes an accumulated response of inflation of 0.15 percentage points (inflation deviates an accumulated 0.15 percentage points from the target) in one year, as shown in Figure 6.4. Given that the accumulated depreciation of the domestic currency in the same period of time is 0.79 per cent, the QPM implicitly considers an exchange rate-to-prices pass-through coefficient of 0.19 percentage points in the first year.

The fact that most prices in the economy are set in domestic currency and not indexed to the exchange rate (low real dollarization) is a key factor in explaining the low exchange rate-to-prices pass-through coefficient. The coefficient is similar to that in Miller (2003), Winkelried (2003) and Morón and Lama (2005). These studies find that the pass-through from the exchange rate to consumer prices is between 0.15 and 0.30 percentage points in one year.[10]

Aggregate demand (IS curve)

Aggregate demand pressures are represented by the output gap. To capture its dynamics, the QPM includes: (i) the domestic currency interest rate; (ii) the

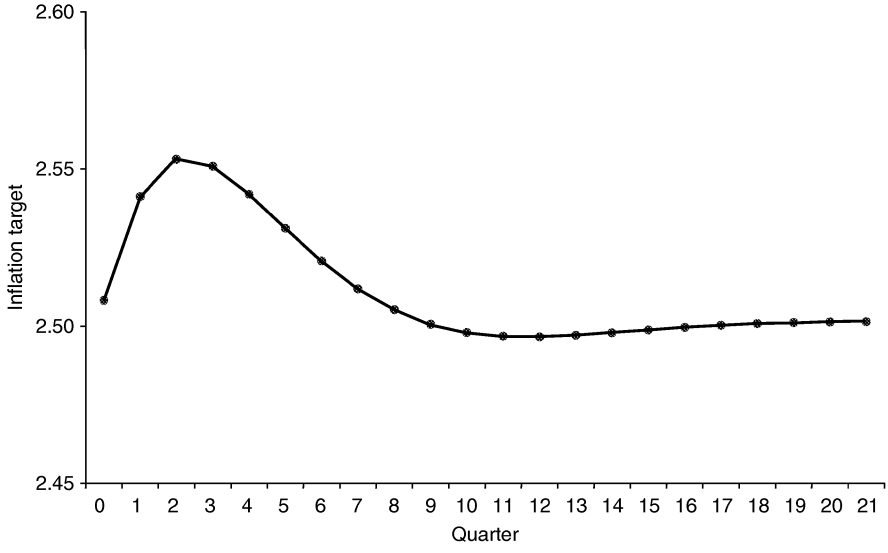

Figure 6.4 Quarterly projection model: headline inflation path after a 1 per cent transitory domestic currency depreciation shock (in per cent)

sol/dollar bilateral real exchange rate; (iii) the foreign currency interest rate;[11] (iv) fiscal conditions that reflect the effect of the fiscal stance on the output gap; and (v) foreign economic conditions, which include terms of trade, the multilateral real exchange rate and economic activity abroad.

The particularity of the IS equation is in the first three terms. Both domestic currency and foreign currency interest rates are measured as deviations from their steady-state values and as averages (which include the current and the next three quarters), with the domestic rate being the interbank overnight real interest rate and the foreign rate being the three-month London Inter Bank offering Rate (LIBOR) real interest rate. An increase in any of the three terms (the two interest rates and the change in the bilateral real exchange rate) reduces the output gap.

The domestic interest rate component in the IS curve reflects the extent to which monetary policy can affect economic activity in the short run. An interest rate increase discourages consumption through the substitution, income and wealth effects, as well as through interest payments on debts; investment is negatively affected by the higher user cost of capital. In the QPM, a 1 percentage point increase in the domestic currency interest rate reduces the output gap by 0.17 per cent. This estimate is higher than Llosa and Miller's (2004) estimate (−0.10 per cent). The difference reflects the fact that the QPM incorporates the possible structural change resulting from the increase in the interest rate pass-through since inflation targeting was adopted (Lahura, 2005).

Among the countries shown in Table 6.4, Peru's output gap's instantaneous response to interest rate changes is below that of Poland, Brazil, Chile and Colombia, and slightly higher than that of the Czech Republic, Turkey and Venezuela. In a financially dollarized economy where consumers and firms are net debtors, the interest rate channel may be weaker than in an economy that is not

Table 6.4 Slope of the IS curve, various countries

	Instantaneous response of output gap to domestic currency interest
Brazil[1]	−0.39
Chile[2]	−0.28
Colombia[3]	−0.19
Czech Republic[4]	−0.12
Poland[5]	−0.65
Turkey[6]	−0.12
Venezuela[7]	−0.06
Peru (QPM)	−0.17

Sources:
1. Springer de Freitas and Muinhos (2001).
2. Corbo and Tessada (2003).
3. Gómez and Julio (2000).
4. Benês *et al.* (2002).
5. Łyziak (2001).
6. Şahinbeyoğlu (2001).
7. Arreaza, Blanco and Dorta (2003).

financially dollarized. Although an interest rate increase still discourages consumption (through the substitution effect) and investment, it also causes the domestic currency to appreciate, thereby reducing the value of foreign currency-denominated debt (in terms of local currency), and inducing a positive net wealth effect. Hence, the balance sheet effect makes monetary policy less effective.

Instead, the expectations channel should acquire more relevance. If the inflation target is credible, an increase in the policy interest rate should lower expected future inflation, thereby raising the real interest rate (both in local and foreign currency), and reducing the output gap. Meeting the inflation target should enhance the credibility of the central bank, hence its ability to control the real interest rate.

The traditional positive effect of a domestic currency real depreciation over net exports, hence the output gap, is captured by the multilateral real exchange rate. However, to capture balance sheet effects, the IS equation also includes the bilateral (sol/dollar) real exchange rate. The extent and effects of dollarization on the economy are difficult to measure, however. In particular, large exchange rate movements may have non-linear effects on economic activity. Moreover, an unexpected large domestic currency depreciation could cause a severe economic downturn if the negative balance sheet effect dominates. In this case, there could be a negative pass-through from the depreciation to inflation. Indeed, Carranza, Galdón-Sánchez and Gomez Biscarri (2004) find that this is generally the case for highly dollarized economies. As the QPM assumes moderate exchange rate changes, these non-linear effects are not present.

The foreign currency interest rate also captures the presence of financial dollarization.[12] Given dollarization, changes in the dollar interest rate will also affect consumption and investment decisions, hence the output gap.

Exchange rate equation

The exchange rate equation relates spot exchange rate movements to the difference between the domestic currency interest rate and the foreign currency interest rate, with a risk premium term. An inertia term is added to reflect the fact that, due to financial dollarization, the BCRP smooths out the path of the exchange rate with forex interventions.

Monetary policy rule

The BCRP's operational target depends on two variables: the deviation of the inflation forecast from target and the output gap. There is also a smoothing term. In contrast, the exchange rate is not directly included; monetary policy responds to exchange rate fluctuations only inasmuch as they affect inflation. This does not mean, however, that potential non-linearities resulting from large currency depreciations are not taken into account. We come back to this issue in Section 6.4.

Inflation targeting in practice

The Peruvian experience during the last three years of inflation targeting has been quite successful and does not appear to be very different from that in other

inflation-targeting countries. Economic activity has been recovering, with a negative but smoothly closing output gap. CPI-inflation fluctuations have been driven mainly by supply shocks and imported inflation, and inflation expectations have generally remained at the target level.

The goal of this subsection is to show that the communications strategy, in which the inflation report plays a key role, has been successful to anchor inflation expectations at the target level. This was shown to be particularly important in 2004, when successive supply shocks hit the economy and inflation deviated more than 1 per cent above the inflation target level.

Starting point: deflationary pressures

When inflation targeting was adopted in 2002, the economy was in a recession (GDP growth was 0.3 per cent in 2001) and there was a deflation risk (the inflation rate was 0 per cent in 2001 and negative during the first quarter of 2002). As a result, the monetary policy stance was loosened aggressively, starting in the second half of 2001 (the interbank rate fell from 8.4 per cent in July to 3.1 per cent in December) and continuing during the first half of 2002, when the interbank rate reached 2.5 per cent. Given the monetary policy lags, year-on-year inflation and output growth rebounded during 2002 (the growth rate rose from 0.3 per cent in 2001 to 4.9 per cent in 2002 and the rate of inflation rose from – 0.1 per cent in 2001 to 1.5 per cent in 2002).

In the second half of 2002, the BCRP tightened its monetary policy stance and the interbank interest rate rose from 2.6 per cent in June to 3.8 per cent in December. This tightening occurred in a context of upward pressures on the exchange rate due to an increase in regional risk deriving from the electoral process in Brazil. During 2003–4, the variability of the inflation rate was mainly explained by supply shocks that were perceived to be transitory and, hence, did not warrant a policy response. Instead the Central Bank emphasized their transitory nature in its inflation reports. Once the impact of these shocks vanished, the inflation forecast for 2003 declined to the lower half of the target range. Accordingly, in the second half of the year, the BCRP reduced its policy interest rate four times, lowering the interbank interest rate from 3.8 per cent in June to 2.5 per cent in November.

Dealing with inflationary pressures: 2004

The annual rate of inflation accelerated in the first half of 2004 and reached 4.6 per cent in August, above the upper limit of the target range (3.5 per cent). This was mainly related to supply shocks that resulted from imported food prices (wheat and oil) and lower domestic agricultural production. As a result, the BCRP communicated to the public the transitory nature of the effects of these shocks on inflation and, furthermore, raised the interbank interest rate twice (in August and October), from 2.5 to 3 per cent. By the end of 2004, inflation had fallen back to within the band and declined further to 3 per cent in January, following the reversal of supply shocks (Figure 6.5).

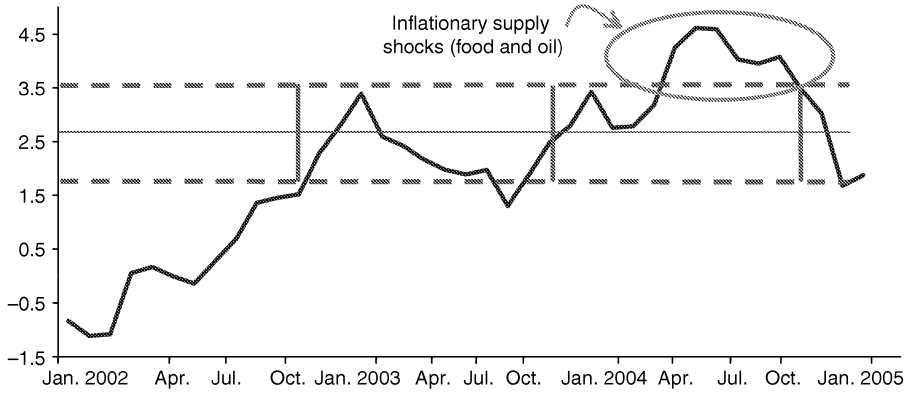

Figure 6.5 Peru: consumer price index (annual percentage change)

6.4 Controlling financial dollarization risks

The previous two sections of this chapter showed how financial dollarization is taken into account in the design and implementation of monetary policy. For the inflation target to be credible, it should be perceived as the central bank's most important target. Hence, no other variable, such as the exchange rate, should overshadow it. However, allowing the domestic currency to sharply depreciate in a financially dollarized economy involves considerable risks. This section describes the additional policies, beyond inflation targeting, that mitigate these risks (BCRP Annual Report, 2003). These policies aim at: (i) reducing the economy's vulnerability to large exchange rate movements by promoting financial de-dollarization and inducing economic agents to better internalize its risks; (ii) limiting balance sheet effects; and (iii) ensuring the availability of liquid funds in foreign currency to meet a possible liquidity shortage in the financial sector. Figure 6.6 summarizes this approach.

De-dollarization policies

To reduce the risks associated with financial dollarization, a first obvious policy is to reduce financial dollarization itself. While substantial, financial dollarization has declined over the past few years, as shown in Table 6.5. Broad money dollarization has fallen by 12 percentage points (from 67 per cent to 55 per cent) since the adoption of inflation targeting and dollarization of credit to the private sector fell 6 percentage points (from 80 per cent to 74 per cent) during the same period.[13] The fact that credit de-dollarization has been slower than deposit de-dollarization could be related to the fall in depreciation expectations. If borrowers expect the domestic currency to appreciate against the dollar, they will prefer to borrow in foreign currency,[14] especially considering that lending rates in foreign currency are lower than in domestic currency. However, banks could be failing to adequately internalize financial dollarization risks. The increase in mortgage loans in dollars during 2004 suggests that this might be the case.[15]

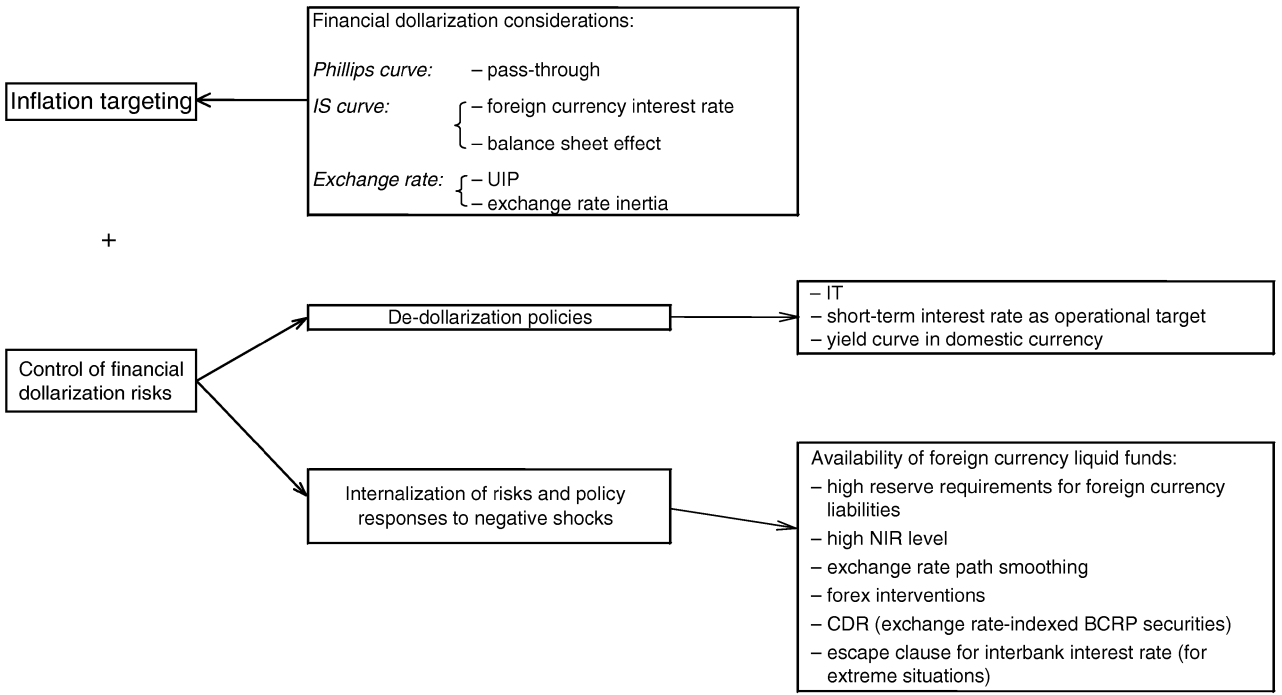

Figure 6.6 Monetary policy framework in Peru

Table 6.5 Peru: financial dollarization indicators (per cent of total monetary aggregate)

Year	Banking system broad money	Banking system credit to the private sector	Financial system credit to the private sector
1993	69	76	77
1994	64	74	74
1995	63	71	72
1996	67	74	72
1997	65	77	75
1998	69	80	79
1999	70	82	82
2000	70	82	81
2001	67	80	78
2002	65	79	76
2003	62	77	73
2004	55	74	71

Source: BCRP.

Nonetheless, credit to the private sector in domestic currency grew rapidly during 2002–4. Including holdings of corporate bonds by institutional investors, private credit grew by more than 10 per cent per year. Microfinance institutions (with annual growth rates of 25 per cent in 2003 and 32 per cent in 2002) and institutional investors (with a growth rate of 32 per cent in 2003) stood out. Instead, credit to the private sector in foreign currency fell in 2002 and 2003 (by 2 and 3 per cent respectively). While institutional investors increased their credit in foreign currency (by 23 and 36 per cent in 2002 and 2003 respectively), commercial banks reduced it (with negative growth rates of 3 and 6 per cent in 2002 and 2003 respectively).

De-dollarization was encouraged by BCRP policies, including inflation targeting, which anchors long-run inflationary expectations, thereby setting the bases for building healthy local financial and capital markets in domestic currency. The difference between short-run inflation expectations and the inflation target has tended to decrease (Figure 6.7), which can be related to the implementation of the inflation-targeting framework. Inflation expectations in the medium run are similar to the inflation target (2.5 per cent).

This anchoring of inflation expectations reflects the BCRP's reputation as an institution seriously committed to its inflation target. Comparing central banks' record in meeting their inflation targets, Albagli (2004) shows that the relative deviation of inflation from target was lower in Peru than for other inflation-targeting countries over the past ten years. When inflation has deviated from target in Peru, the deviation has usually been negative (actual inflation was below target), especially during the disinflation process (Armas, Grippa and Quispe, 2001).

Although medium-run inflation expectations seem to be well anchored around target, long-run inflation expectations are more relevant for long-run savings and borrowing decisions. That progress has also been achieved in anchoring longer-term expectations as can be inferred from the fact that the spread between the yield of

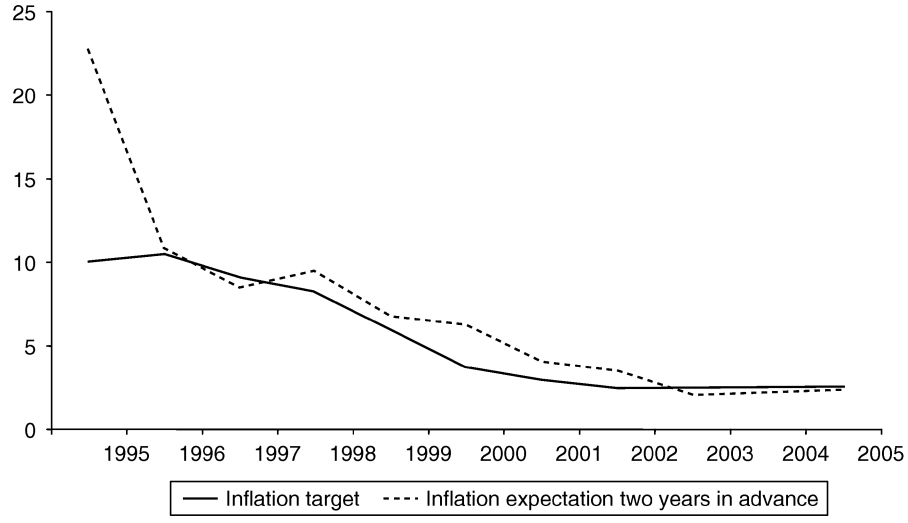

Figure 6.7 Peru: inflation target and expectations, 1995–2005
Source: Consensus forecast.

Table 6.6 Peru: Treasury bond interest rates in the local capital market

Date	7-year T-bond (in nominal domestic currency)	7-year T-bond (inflation indexed)	Spread	Inflation (accumulated over the last year)
August 2004	12.63	6.81	5.82	4.59
September 2004	11.31	6.10	5.21	4.03
October 2004	9.94	5.93	4.01	3.95
November 2004	9.60	5.90	3.82	4.08
December 2004	9.60	6.05	3.55	3.48
February 2005	8.26	5.81	2.45	1.68

Source: BCRP.

seven-year Treasury bonds in nominal domestic currency (the current longest term) and the yield of Treasury inflation-indexed bonds in domestic currency for the same maturity (i.e., expected inflation) is gradually approaching the inflation target (Table 6.6). Part of this reduction could also be due to the BCRP's reputation. As Table 6.6 shows, market recognition of the Central Bank's commitment to its inflation target (last column) helped to reduce long-run inflation expectations (third column in the table). This proxy for long-run inflation expectations (seven years ahead) was by February 2005 similar to the inflation target: 2.45 per cent.

A second factor behind the de-dollarization process is the greater stability of real returns on assets denominated in domestic currency. Financial dollarization is reduced when real returns on these assets become more stable than returns on assets in foreign currency (Ize and Levy Yeyati, 1998). Inflation targeting has helped

to reduce inflation variability. However, it is also crucial that the variability of nominal interest rates in domestic currency be reduced. This was achieved by shifting the operational target from banking reserves to the interbank overnight interest rate, which reduced the variability of sol rates and helped increase their predictability (see Table 6.11).

In turn, the gradual development of the local government bonds market in domestic currency has been allowed to build a yield curve in soles that acted as a benchmark for long-term private sector bonds (Table 6.7, Figure 6.8).[16] As a result, securities denominated in domestic currency amounted to 33 per cent of fixed-income securities issued by the private sector in 2004 (against only 22 per cent in 2000). Moreover, the share of nominal soles bonds has rapidly increased over the last few years, as shown in Table 6.8, while the share of inflation-indexed bonds has remained relatively constant.

In addition, the legislature issued a law in mid-2004 requiring all prices to be listed in domestic currency. The option of listing prices also in foreign currency was left open. This law increases the transparency of price information and should encourage financial de-dollarization in the long run (before the law was issued, durable goods and real estate prices were being set in foreign currency, perhaps reflecting in part the fact that they are ways of storing value).

Financial dollarization risks

Financial dollarization causes two types of mismatches in the balance sheet of economic agents (Baliño, Bennett and Borensztein, 1999): maturity and currency mismatches. Regarding the latter mismatch, it causes the private non-financial sector to face an exchange rate risk. This is because its income is basically

Table 6.7 Peru: securities balances and average bond terms

	Securities balances (S/. million)			Bonds' average term (in years)	
	Private sector[1]		Government		
Year	Total	In domestic currency (nominal terms)	In domestic currency	Private sector bonds[2]	Treasury bonds
1998	2,265	60	–	–	–
1999	2,705	60	–	–	–
2000	4,005	88	–	2.0	–
2001	4,598	792	1,200	2.0	2.2
2002	5,088	756	1,933	2.0	2.1
2003	6,956	1,124	2,660	2.8	3.0
2004	8,629	1,226	3,751	2.9	4.4
Jan. 2005	7,789	1,329	3,928	2.9	4.5
Feb. 2005	7,846	1,396	4,138	2.9	4.6

1. Includes only non-financial firms.
2. Includes financial and non-financial firms.

Source: BCRP.

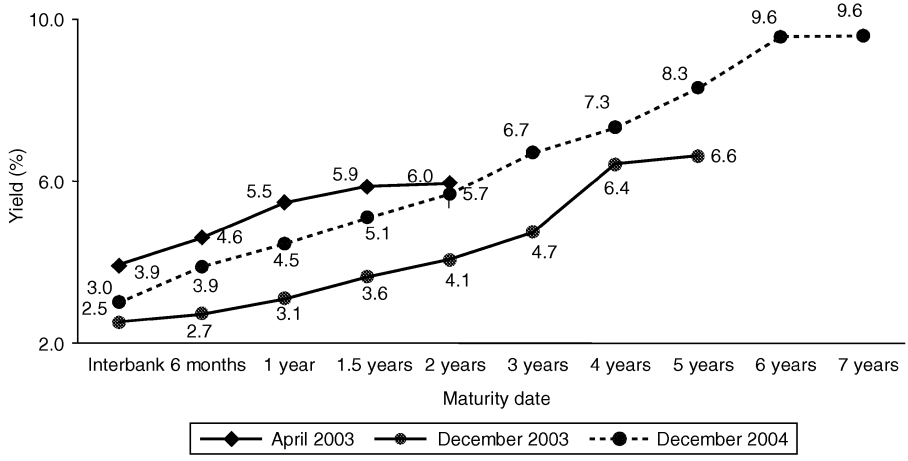

Figure 6.8 Peru: interest rates for domestic currency Treasury bonds (in per cent)
Source: BCRP.

Table 6.8 Composition of fixed-income securities issued by the private sector[1] (in per cent)

	Domestic currency			
Year	**Nominal**	**VAC[2]**	**Total**	**Foreign currency**
1998	1	26	27	73
1999	1	22	23	77
2000	2	20	22	78
2001	11	17	28	72
2002	13	17	30	70
2003	16	18	34	66
2004	16	17	33	67
January 2005	18	18	36	64
February 2005	18	18	36	64

Notes: 1. Includes bonds and short-term instruments issued by private financial institutions.
2. Inflation-indexed.

Source: BCRP.

denominated in domestic currency, while it has debts in foreign currency. Thus, an unexpected large domestic currency depreciation may undermine the solvency of the private non-financial sector, thereby increasing the financial sector's credit risk. The financial sector, on the other hand, has a maturity mismatch that is related to the fact that it has short-term liabilities in foreign currency, while its assets in the same currency have a longer average maturity. Although this type of liquidity risk is common to banking systems, the risk in a financially dollarized economy is higher because the central bank does not issue foreign currency.

International reserves

If a bank run on foreign currency-denominated deposits occurs, a high level of net international reserves acts as a buffer stock for supporting the financial system. Moreover, the availability of international reserves may in itself be an insurance against negative shocks:[17] if agents perceive that the financial system has or is able to obtain liquid foreign currency funds in emergencies, the probability of the bank run will be reduced. According to Gulde *et al.* (2004), in the case of a bank run, foreign currency liabilities need to be paid at par against foreign currency, which inhibits equilibrating adjustments through the exchange rate. Thus, central banks need international reserves to provide foreign currency lender of last resort support to distressed banks. International reserves are also necessary for the central bank to carry out foreign-exchange interventions aimed at smoothing the path of the exchange rate during a large depreciation episode.

Gulde *et al.* (2004) point out that international reserves covered nearly all foreign currency deposits in the Peruvian banking system during 2002. Together with sound fundamentals, this explains the stability of foreign exchange deposits in Peru during the last Argentine crisis, when Paraguay, Uruguay and (to some extent) Bolivia, all of which are financially dollarized, suffered a contagion effect that triggered runs on foreign currency liabilities.

Since the beginning of 2003, the BCRP has purchased around $4.5 billion (as of 31 March 2005) in the foreign exchange market. This has allowed a strengthening of the Central Bank's international reserves and an accommodation of portfolio movements in a context of steady financial de-dollarization (BCRP Inflation Report, 2004). Thus, international reserves exceeded $13.5 billion in March 2005, the highest level ever recorded. This is an important buffer stock against any shock, considering that it is more than twice the stock of the due-in-one-year external debt. The coverage ratios of short-term external liabilities and broad money have also improved during the last two years (Table 6.9).

Reserve requirement on dollar liabilities

A drawback of holding high international reserves is that, as with any insurance system, it may induce moral hazard. Given that economic agents know that there is a high probability that the central bank would use the international reserves to

Table 6.9 Peru: international liquidity indicators

	2000	2001	2002	2003	2004
NIR/short-term external liabilities	1.5 times	1.7 times	2.2 times	2.2 times	2.3 times
NIR/imports of goods and services	13 months	14 months	16 months	15 months	15 months
NIR/banking system broad money	61 per cent	61 per cent	65 per cent	67 per cent	69 per cent

Source: BCRP.

provide liquidity in a 'bad state of nature', the financial system may fail to internalize dollarization risks. To limit this problem in Peru, the financial system is also subjected to a 30 per cent reserve requirement on foreign currency liabilities (compared to 6 per cent on domestic currency liabilities). The high reserve requirements on foreign currency bank liabilities can also be used by the central bank to provide dollar lender of last resort support. Actually, they are part of international reserves.

Exchange rate smoothing

Last, but not least, the BCRP has a policy of moderating excessive exchange rate volatility to limit the negative effects of large exchange rate fluctuations. Indeed, since the adoption of inflation targeting in 2002, the standard deviation of the exchange rate has on average been similar to that in the previous three-year period (Table 6.10). Allowing the operational target for monetary policy to shift back to monetary targeting under pressure, as explained in Section 6.2, provides one mechanism to smooth the exchange rate path under extreme situations. In addition, however, the BCRP stands ready to intervene in the foreign exchange market and has done so abundantly in recent years (although mostly to limit appreciations).

However, forex interventions are not committed to a fixed or stable exchange rate, which would be inconsistent with an inflation-targeting framework and would probably exacerbate moral hazard (by providing an implicit foreign exchange insurance). Instead, it is convenient to let the exchange rate float because that is an incentive for economic agents to de-dollarize and for the hedging market to develop. In turn, lower dollarization should reduce the risks of exchange rate variability, allowing the BCRP to let the exchange rate float even more, turning into a virtuous circle.

The BCRP can also issue exchange rate-indexed securities (CDRs) to smooth the path of the exchange rate, in particular when there are domestic currency depreciation pressures. These CDRs are denominated in domestic currency but adjusted for foreign currency price movements. Thus, they are aimed at providing the market with a hedging asset and reduce the upward pressure on the exchange rate. This market instrument is also used in Brazil and Chile.

Table 6.10 Peru: exchange rate variability

	Exchange rate	
Period	**Average mean (S/.)**	**Average standard deviation (S/. cents)**
1999–2001	3.460	1.3
2002–04	3.470	1.2

The average standard deviation is an average for monthly standard deviations in each of the two periods considered in the table.

Source: BCRP.

Table 6.11 Peru: interest rate variability

Period	Interbank overnight interest rate	
	Average mean (%)	Average standard devation (pp)
1999–2001	12.3	2.8
2002–04	3.1	0.2

The average standard deviation is an average for monthly standard deviations in each of the two periods considered in the table.

Source: BCRP.

6.5 Concluding remarks

Peru is the only highly financially dollarized economy that has adopted an inflation-targeting framework for monetary policy. Thus, the country's inflation-targeting design and implementation differs in some respects from non-dollarized inflation-targeting countries. This chapter described those differences.

With respect to the *design* of monetary policy, the inflation target in Peru is the lowest in Latin America (2.5 per cent, +/− 1 percentage point). With strict price stability, similar to US long-run inflation, the domestic currency is in a better position to compete against the dollar in terms of real and payments dollarization.

The *implementation* of monetary policy also differs from that in non-dollarized inflation-targeting countries in terms of the model used for inflation forecasting and the policies that the BCRP implements to deal with financial dollarization risks. These policies can be divided into three types: de-dollarization, internalization of financial dollarization risks by economic agents and measures to limit financial vulnerabilities. While the latter are aimed in part at smoothing the exchange rate path, allowing the exchange rate to float is also desirable because it encourages agents to de-dollarize. In turn, lower dollarization reduces the risks of higher exchange rate variability.

The first three years (2002–4) of inflation targeting in Peru provide encouraging results and lessons. First, the empirical evidence shows that financial dollarization does not preclude an independent monetary policy oriented at maintaining a low and stable inflation rate. Peru's announced annual inflation target has been achieved every year since inflation targeting was adopted. Output variability was moderate in these years.

Second, changing the operational target from a monetary aggregate to the interbank overnight interest rate has improved the transparency and predictability of the monetary policy stance. It has also favoured the issuance of long-term financial instruments by the private sector, thus helping induce financial de-dollarization.

Third, a gradual de-dollarization process has been observed during the last four years in the financial system's assets and liabilities. This process has been encouraged by the inflation-targeting framework, with more predictable inflation and domestic currency interest rates, and by the development of the local government

debt market in domestic currency, which is useful for setting a benchmark for issuance of private sector nominal domestic currency securities.

Fourth, the Peruvian monetary policy framework (inflation targeting plus financial dollarization risks control) has managed to protect the economy from contagion during the Argentinian crisis. In this, Peru stands in sharp contrast with most of the other highly dollarized South American countries.

Admittedly, however, Peru's experience with inflation targeting is still short and cannot as yet provide a definite answer on how to fully restore long-run confidence in the local currency. Financial dollarization and its risks remain high. Nonetheless, it seems to be a promising approach to address the complex phenomenon of a dual currency economy.

Notes

1. The views in this paper are those of the authors and do not necessarily represent those of the Central Reserve Bank of Peru. We are grateful to Paul Castillo, Óscar Dancourt, Rafael Herrada, Alain Ize, Eduardo Levy Yeyati, Vicente Tuesta and Marco Vega for their insightful comments. Any remaining errors are solely ours.
2. Armas, Grippa and Quispe (2001) describes monetary policy during the disinflation process between 1991 and 2001.
3. See Grippa (2004).
4. The Constitution establishes that the BCRP's objective is to preserve monetary stability. It also stipulates that the BCRP is autonomous according to its Charter Law. This autonomy is supported by the fact that the BCRP is explicitly prohibited from taking actions against its objective, which includes the prohibition of granting direct loans to the Treasury.
5. During the disinflation period, when a monetary-targeting framework was used, the BCRP began to announce one-year inflation targets in 1994 (Rossini, 2001).
6. Real dollarization is the indexing of local prices and wages to the dollar; payments dollarization, on the other hand, is the use of foreign currency for transaction purposes.
7. Felices and Tuesta (2002) develop a model where both domestic and foreign currency coexist in the economy. Their preliminary results show that Peruvian macroeconomic volatility in the last few years has declined as a result of the shift from monetary targeting to interest-rate targeting.
8. Grippa (2004) provides more details on this transition period.
9. A close reference to the QPM is Luque and Vega (2003).
10. McCarthy (1999) develops an empirical model to assess the transmission from the exchange rate to three types of prices: importer, producer and consumer. Miller (2003) uses this model for Peru and finds that the nominal exchange rate-to-prices pass-throughs are 89, 46 and 16 percentage points respectively in one year. Winkelried (2003) uses McCarthy's model and incorporates asymmetries into the analysis. He estimates the pass-through to consumer prices to be 0.15 percentage points in one year. However, this estimate could rise to 0.30 percentage points in a year during the expansionary phase of the business cycle. Morón and Lama (2005) add a monetary sector to the analysis. Their estimated pass-through coefficients to import, wholesale and consumer prices are 80, 30 and 20 percentage points in one year respectively.
11. A similar type of IS specification can be found in Dancourt *et al.* (2004).
12. The inclusion of the foreign currency interest rate in the IS curve acknowledges the fact that local and foreign currencies remain imperfect substitutes in the credit market.
13. The valuation effect due to domestic currency appreciation in 2003 and 2004 explains around 1 percentage point of the reduction in financial dollarization indicators in each of these two years.

14. The uncovered interest rate parity does not hold at every moment of time.
15. In 2004, mortgage loans grew by S/. 551 million. However, only 1.8 per cent of this flow was in domestic currency; the rest was in foreign currency.
16. Before 2001 there were no benchmark interest rates for the issuance of nominal securities in domestic currency. Since 2001, the Treasury began to issue nominal bonds in soles with maturities of two and three years. The government bonds market grew slowly, but it was not until 2003 that it showed its largest expansion, with the implementation of the primary dealers system. At the end of 2004, there were nominal Treasury bonds in domestic currency with maturities up to seven years. Private sector firms have followed these Treasury bonds issues: corporate bonds have been issued at terms of four and five years.
17. The estimation of an optimal international reserves level as 'self insurance' for a financially dollarized economy goes beyond the scope of this chapter. Clearly, this optimal level should depend on the degree of financial dollarization, fiscal and banking solvency, and degree of openness of the economy, among other variables.

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Comments on Chapters 5 and 6

Klaus Schmidt-Hebbel

Dollarization presents a daunting task to central banks in many emerging market economies – all those countries where domestic money coexists with a foreign currency to which the domestic population had fled in the past because of domestic monetary mismanagement. Monetary authorities in dollarized economies face a dual challenge. First, they have to conduct monetary policy under the continuous threat of large portfolio shifts between both currencies. Second, they have to bring about monetary stability that is similar to or greater than that of the competing foreign currency, in order to convince their local populations to gradually shift back to using and holding their domestic currency again.

In the pursuit of the latter objectives, central banks in dollarized economies are aided by the fact that much of domestic income is in local currency (or in non-tradable sectors), reinforcing the demand of local currency for transactions and savings. Moreover, high exchange-rate volatility and low inflation (volatility) strengthen the demand for a stable domestic currency that is used for carrying out transactions and building up domestic assets that match income, consumption and balance sheets linked to the domestic economy. Hence a related challenge faced by central banks in dollarized economies is to let the exchange rate float (freely), make their monetary policy more independent of exchange rate shocks and support market development of financial instruments to hedge exchange rate risk.

The two chapters on this subject on which I am about to comment are closely related. Leiderman, Maino and Parrado (Chapter 5) assess differences in monetary policies and outcomes between dollarized and non-dollarized Latin American economies, with and without inflation targeting, with some stronger focus on Peru. Armas and Grippa (Chapter 6) present a full-blown case study of Peru's unique experience, hitherto the only significantly dollarized economy that has adopted IT. After commenting on each of the two chapters, I will briefly discuss the more general issue of 'fear of floating' among IT countries in Latin America and end with some remarks on the Peruvian experience.

Chapter 5

This excellent chapter provides a unique analysis of the challenge faced by current (Peru) and prospective (Bolivia) IT countries in the face of large financial

dollarization, in comparison with non-dollarized inflation targeters in South America (Chile and Colombia). In doing this, the chapter provides new empirical evidence on the interplay between monetary regimes (IT and exchange rate targeting), financial structure (dollarization, financial fragility), monetary policy and inflation. The cross-country and cross-regime evidence provides underpinnings to the notion that dollarization and financial stress are endogenous to monetary regimes and monetary policy performance (inflation) and that – the chapter's main policy inference – 'high dollarization per se does not preclude the use of IT as an effective policy regime'.

Although the authors justify 'leaning against-the-wind' interventions as consistent with – even as a strengthening device of – IT, I will hold a different point of view. Exchange rate (ER) interventions provide implicit insurance against exchange rate volatility and risk, and therefore inhibit de-dollarization and market development of ER risk hedging instruments, leading to larger currency imbalances in balance sheets and hence to higher financial fragility and stronger contractionary effects of ER depreciations. By signalling central bank concern for the ER, such interventions potentially weaken the credibility of the inflation target. Moreover, the political economy of public support of ER interventions leads to pressures for one-sided interventions (when the domestic currency is perceived as overappreciated). Finally, the effectiveness of interventions ranges from small and temporary to dubious and nil (e.g., Tapia and Tokman [2004] on Chile's experience).

My final comments on this chapter are on the monetary policy reaction functions. Its ad hoc specification makes it hard to infer which is the implied neutral policy rate – literally, a variable that combines the constant and the terms involving the Federal Funds rate and (if non-zero) the trend changes in the real effective exchange rate and in nominal net international reserves. It is also not clear why Bolivia's rate of ER crawl should respond to the same variables as those specified for the monetary policy reaction function for the three IT countries, and which should be the expected signs on their coefficients. An expanded set of results for alternative specifications and data samples may be valuable to convince the reader about the robustness of the reported results.

Chapter 6

This excellent chapter reports new evidence and an insightful analysis of monetary policy in Peru. Presented by two important insiders, they should be commended for their balanced and yet insightful discussion of policies and results of the BCRP.

The chapter documents the triple transition led by the BCRP from partial to full-fledged IT, from fear of floating to less fear, and from dollarization towards what I call 'soli(di)fication' (i.e., de-dollarization or making the nuevo sol more solid and attractive to local money holders). The authors also document BCRP's internal projection model, which should eventually be published. Finally, the paper discusses the remaining policy challenges.

The significant progress in Peru's market-based financial soli(di)fication is particularly surprising because it has not been based on mandatory de-dollarization

(like, for example, Argentina's) but is a voluntary shift back into sol financial assets, in response to successful monetary policy. This success is likely to be the result of BCRP's shift from money to the interest rate as its monetary policy instrument (or operational target), the achievement of low inflation and small target misses since 2000, a strong anchoring of inflation expectations to target, a massive decline in volatility of nominal and real interest rates, as well as of inflation, and high reserve requirements on bank dollar liabilities. Moreover, the latter success and BCRP's institutional strength has enabled the bank to pursue an active countercyclical monetary policy, reflected in a strong expansionary stance since 2002 – in all likelihood a result of its independence and strong credibility (as documented for a panel of emerging countries by Calderón and Schmidt-Hebbel [2003]).

Some evidence on fear to float among inflation targeters in Latin America

Four main factors lead to 'fear of floating' in emerging market economies, including some countries that have adopted IT and others that are still considering IT adoption: (i) concerns about high pass-through from ER to inflation; (ii) concerns about financial vulnerabilities arising from highly dollarized liabilities on balance sheets; (iii) fears about loss of export competitiveness; and (iv) concerns about losing a transparent nominal anchor to guide expectations. Do Latin American inflation targeters:

1. fear floating à la Calvo and Reinhart?
2. exhibit large devaluation-inflation pass-through?
3. react strongly to the ER in their conduct of monetary policy?

I will address each of these questions.

Result 1: Macroeconomic volatilities have been consistent with a floating regime since 1999.

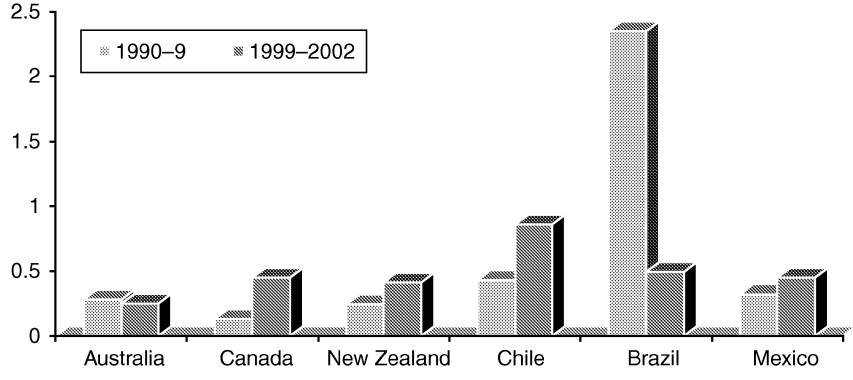

Figure 6C.1 Ratio of exchange rate and international reserve volatilities in six countries
Source: Tapia and Tokman (2004).

Under a floating regime, the ER should gain importance as an adjustment mechanism, while reserves and interest rates should become more stable. In Chile and Mexico, ER volatility has risen significantly relative to reserves volatility. In Brazil it has declined, but is still very high. And in all three Latin American countries, relative ERs to reserve volatilities are similar to or higher than those observed in Australia, Canada and New Zealand (Figure 6C.1).

Result 2: ER pass-through to inflation has declined.
Pass-through from ER depreciation to inflation is larger under low central bank credibility, a high degree of openness and a history of high inflation. Pass-through coefficients (measured as simple correlation coefficients) have fallen significantly in IT countries in Latin America, from levels between 50 and 80 per cent before or at the start of IT to levels that range from 20 per cent in Chile to 50 per cent in Brazil (Schmidt-Hebbel and Werner, 2002; García and Restrepo, 2002).

Result 3: ER is not a significant determinant in Taylor rules of Latin American central banks.
Even under low ER pass-through, monetary policy could react to the ER out of concern for devaluation-induced financial crises and recessions or excessive ER volatility. To test for this, the ER is included as an additional argument in a conventional Taylor rule. The results for three Latin American IT countries (Schmidt-Hebbel and Werner [2002], reproduced here as Table 6C.1) show that the ER is not a significant driver of monetary policy, except in special circumstances, as exemplified by rolling coefficient estimates (Figure 6C.2).

Table 6C.1 Estimations of Taylor rules for Brazil, Chile and Mexico

	Brazil	**Chile**		**Mexico**	
Real interest rate	**1999–2001**	**1991–2001**	**1997–2001**	**1997–2001**	**1999–2001**
Real interest rate lag	0.89	0.92	0.92	0.47	0.68
	(3.88)*	(25.20)*	(14.6)*	(4.79)*	(5.45)*
Expected inflation-inflation target	0.30	0.01	0.01	0.08	−0.66
	(2.42)	(0.04)	(0.05)	(0.16)	(−1.01)
Output gap	0.02	0.01	0.02	0.11	0.08
	(0.50)	(1.56)	(1.15)	(1.34)	(1.25)
Nominal exchange rate	−0.01	−0.01	0.01	0.16	−0.03
	(−0.02)	(−0.27)	(0.41)	(1.51)	(−0.23)
Long-term government bond	0.32	0.03	0.02	1.98	1.49
	(0.51)	(0.64)	(0.09)	(4.02)*	(2.86)*
Trade deficit lag (exports–imports)	−0.01	−0.01	−0.01	−0.01	−0.01
	(−0.1)*	(−2.49)*	(−1.75)	(−3.2)*	(−2.7)*
Summary statistic					
Adjusted R^2	0.75	0.88	0.87	0.80	0.81
Durbin-Watson statistic	1.92	1.64	1.68	2.17	1.95

Source: Schmidt-Hebbel and Werner (2002).

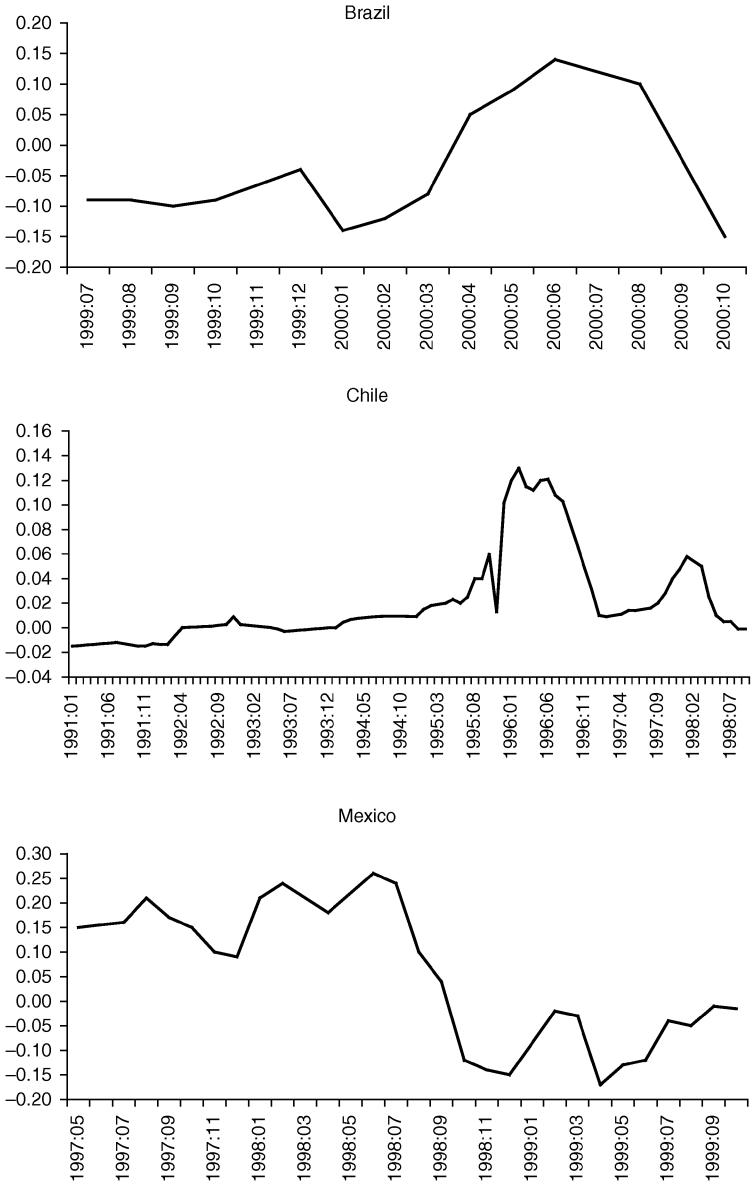

Figure 6C.2 Monetary policy response to the exchange rate in Brazil, Chile and Mexico (rolling coefficient estimates)

Source: Schmidt-Hebbel and Werner (2002).

Final Remarks on Peru

Peru has gone a long way toward full-fledged IT, reaping many of the benefits that world evidence on IT shows can be obtained (Mishkin and Schmidt-Hebbel, 2005). Peru's progress in price stabilization has been impressive: inflation is at low stationary levels, inflation targets are met and expectations are anchored to inflation targets; BCRP's switch of operational target from money to the interest rate has increased effectiveness of monetary policy and contributed to soli(di)fication. And, in contrast to other mandatory de-dollarization experiences, soli(di)fication has been based on the markets' voluntary response to policy changes and correct incentives.

Peru faces one important policy challenge towards completion of its full-fledged IT framework. This is accelerating its pace towards more floating, through less frequent exchange market interventions, more support of issuance of sol-denominated liabilities and support of market development of financial instruments that protect against ER risk. Peru's policy framework and achievements are ripe for taking these steps, which will reinforce soli(di)fication and monetary policy effectiveness.

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Part III
Prudential Policy

7

To Hell and Back – Crisis Management in a Dollarized Economy: The Case of Uruguay

Julio de Brun and Gerardo Licandro[1]

7.1 Introduction

In July 2002, a banking holiday marked the pinnacle of a 45 per cent run on bank deposits in the Uruguayan economy, culminating in the worst banking crisis the country has ever known. At the same time, Uruguayan country risk reached 3099 basis points, a figure unknown for a country that just five months earlier was within the investment grade range according to the most prestigious rating agencies. Considering the run on the currency experienced early in 2002, by July Uruguay had suffered a 'triple' crisis, i.e., a currency crisis, a public debt crisis and a panic in the banking sector.

Not even the largest financial package ever engineered by the IMF, in terms of GDP, could save the country from the record-breaking fall in deposits, the restructuring of deposits in public banks and a comprehensive restructuring in public debt. Down the road, two attempts to stop the crisis failed, leading to an unprecedented fall in GDP of 10.8 per cent, the largest one-year fall ever recorded in Uruguayan history.

On 27 July, eight months after the start of the crisis, Uruguay went into a four-day banking holiday. At that time, under a programme supported by the IMF, four banks were closed, time deposits in public banks were reprogrammed and the restructuring of public debt was decided. Ten months later, the economy started to show signs of what is now acknowledged to be a firm recovery on all fronts. In the twelve months following the restructuring of public debt, GDP rose by 12.7 per cent, inflation declined to 10 per cent, the primary surplus reached 4.1 per cent and the financial system recovered $800 million in deposits.

The purpose of this chapter is twofold. First, we would argue that, despite some elements of contagion, irrational behaviour should not be regarded as the main explanation for the Uruguayan collapse. Financial fragility, due to liability dollarization and a misdesigned safety net, together with the strong real exchange rate depreciation and spill-over effects derived from the Argentinian crisis (namely, a fall in regional demand, a decline in the terms of trade, solvency issues in the financial sector linked to investments in Argentina and financial contagion), led to a simultaneous rational run on the domestic banking system and public debt

(a sudden stop). The link between the fiscal accounts and the banking sector, through an implicit deposit insurance supported by the public finances, will be stressed.

Second, we will review the crisis resolution strategies and discuss why the first two stabilization attempts failed – despite the large back-up from international financial institutions – while the third succeeded. Finally, we will take a look at the recovery of the Uruguayan economy and identify some basic lessons to be learned from the recent experience.

7.2 Uruguay in the 1990s: investment grade and structural fragility

In 1997, Uruguay reached investment-grade status based on what appeared to be very strong growth and a good fiscal performance. The investment grade marked the pinnacle of a gradual process of macroeconomic reform that started in the early 1990s. The reforms tackled a rather wide set of issues, ranging from monetary policy to trade policy. Nonetheless, behind these improvements lay a severe case of financial fragility, enhanced by an unsustainable regional boom. For that reason, it is not necessary to resort to irrational behaviour to explain the crisis experienced in 2002.

Trade, Mercosur and the regional bubble

The first macro pillar of the reforms of the 1990s was Mercosur. Uruguay, following the lead of Brazil and Argentina, entered the trade agreement as a platform to enhance the chances of survival of Uruguayan enterprises in a context of increasing trade openness and to reduce the social cost of foreign competition. The Uruguayan strategy was to open up to Mercosur before Mercosur opened up to the world.[2]

However, even if it could be argued that Mercosur succeeded in developing trade between member countries, the process of opening up to the world never took place. After the signature of the Treaty of Ouro Preto (1994), a tariff convergence schedule was put in place that worked effectively until 1998. The common external tariff, instead of declining over time, rose in 1998 to accommodate the needs of Brazil, never to be reduced again.

As expected, trade with Mercosur grew steadily between 1990 and 1998, raising the region's share of Uruguay's total exports in terms of goods and services from 45 per cent in 1990 to 67 per cent in 1998. However, down the road, Uruguay became more closed to the rest of the world.

Export concentration was enhanced by the implementation in the region of exchange rate-based stabilization plans that boosted regional demand. Argentina started its Convertibility Plan in 1990, Uruguay introduced a target zone in 1991[3] and Brazil adopted the Real Plan in 1994. The stabilization plans and the Mercosur process were fostered by large inflows of capital to the region until 1997, which favoured the appreciation of regional currencies.

It has been argued that, in Uruguay, the resulting regional consumption boom led to a 'Dutch disease'. Given the close links between Uruguay and the rest of the

region, particularly Argentina, a large share of what usually would be non-tradable goods turned into regional goods. Following an increase in regional demand, this led to increases in regional prices, and an appreciation of the domestic currency, that crowded out tradable production.[4]

This expansion turned out to be unsustainable and ended with the abandonment of the Real Plan in 1999 and the collapse of the Convertibility Plan in Argentina in 2001. However questionable, it is possible ex post to characterize what happened in the region in the 1990s as a bubble, or a transitory situation. In this type of economic environment, if the aim is to mitigate the negative effect on the tradable sector, control of aggregate spending is needed, which means strict control of both public and private consumption. In the next sections we will see that neither of these two conditions was met.

The fiscal front

On the fiscal side, three important measures were implemented to improve the prospect of debt sustainability: (i) fiscal adjustment plans were enacted in early 1990 and early 1995, to compensate for increases in public expenditure and investments in the previous electoral years, as well as the negative impact on revenues of downturns in economic activity in 1989 and the 'tequila effect' in 1994; (ii) the renegotiation of public external debt in the framework of the Brady Plan in February 1991 relieved the pressure of interest payments; and (iii) the 1995 reform of the pension system transformed a pure pay-as-you-go system into a mixed system that combined a capitalization scheme with a pay-as-you-go component.[5] According to the projections made at the time, despite having a medium-term fiscal cost, in the long run the reform should have brought about a GDP reduction of 3 to 5.5 per cent in social security outlays (Masoller and Rial, 1997; Forteza, 1999).

At the time these measures appeared to provide a rather orderly consolidation of public accounts. After peaking at 7.4 per cent of GDP in 1989, the fiscal deficit dropped to the 1–2 per cent range between 1997 and 1998. However, the improvement in fiscal performance as measured by conventional definitions of the deficit, failed to show the real situation of the public sector's accounts. Figure 7.1 shows how the fiscal result would have changed had the government stuck to a constant rate of growth for real expenditures, based on a 3 per cent growth of GDP, which arguably is a conservative assumption taking into account the rate of growth of potential GDP (Bucacos, 1997). If we start from a 'normal' year, this rule should ensure a fiscal balance over the business cycle. According to this cyclically adjusted fiscal balance, the pro-cyclical behaviour of public accounts led to an accumulation of debt of almost 22 per cent between 1993 and 2001.

Dollarization of public debt plays an important role in the pro-cyclical behaviour of fiscal policy. The first effect is direct and comes from the real cost of interest rate payments. As the real exchange rate appreciates during expansions, paying interest on the public debt becomes easier than it would have been had the real exchange rate evolved differently. A second effect arises from the relationship between the risk premium and the debt to GDP ratio. A cheaper dollar results in a

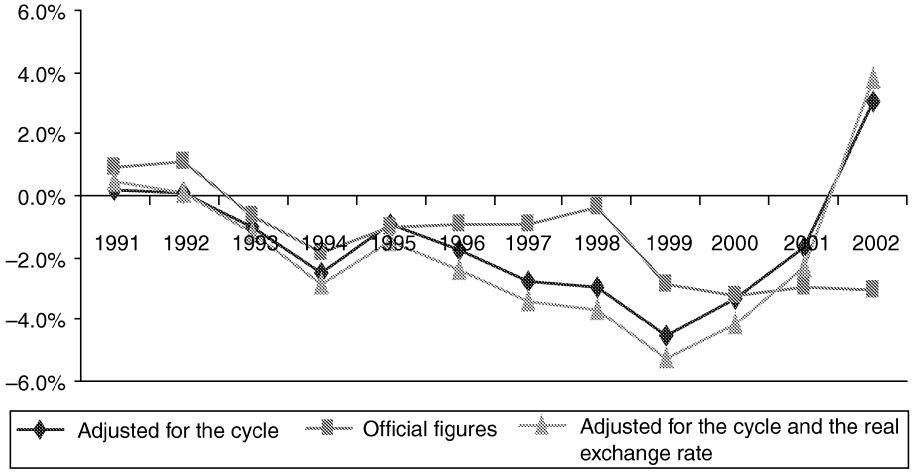

Figure 7.1 Uruguay: fiscal balance, 1991–2002

larger GDP in dollar terms, resulting in an apparent reduction in the indebtedness of a country and a lower risk premium.

During the 1990s, the Uruguayan debt to GDP ratio fell by 26 per cent of GDP, reaching 30 per cent in 1998. Since the stock of debt in dollars rose during that period, the full burden of the adjustment was due to the increase of GDP in dollar terms. After 1998, public revenues were affected by a three-year recession. Starting with the fall in Brazilian demand derived from the abandonment of the Real Plan in January 1999, Uruguay experienced a succession of negative shocks that deteriorated its fiscal balance. The government, while trying to control expenditures, allowed the fiscal deficit to reach 4 per cent of GDP between 1999 and 2001, further increasing the debt to GDP ratio to 54 per cent in 2001.

The financial fragility of the banking system

The lack of confidence in monetary policy, after four decades of high inflation and successive failed attempts at reducing it, naturally led to the extended use of foreign currency as a substitute for the peso, thereby allowing a sharp increase in the dollarization of financial instruments during the last quarter of the 20th century (Licandro and Licandro, 2003).

The business cycle associated with the exchange rate-based stabilization plan and the renewed access to markets for voluntary sovereign debt in a context of high international liquidity gave banks stimulus to expand dollar-denominated credit to the private sector, which doubled between 1994 and 1998.[6]

The currency blindness of the regulatory framework and the implicit guarantees provided to both debtors and depositors of the banking system generated a perverse set of incentives that distorted the perception of risk. Debtors were not afraid of taking credit in dollars, both because there was a target zone for the exchange rate that was preannounced (exchange rate guarantee), and because

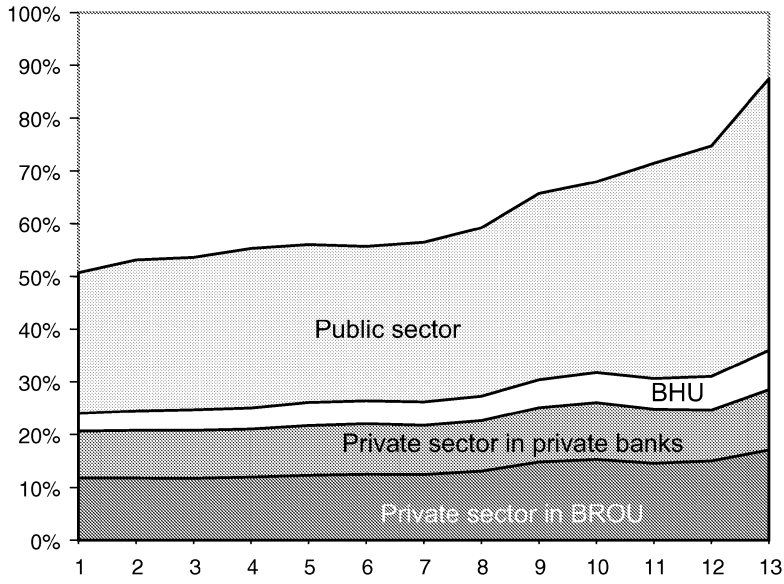

Figure 7.2 Uruguay: currency mismatch across sectors (per cent of GDP)

experience told them that, should anything happen with the exchange rate regime, the government would bail them out as it had done in the past. Nor did depositors care about the quality of the banks' portfolios because there was an implicit guarantee on deposits. With this set of incentives, regulation could have prevented risk-taking behaviour, but it did not. Capital requirements and provisions did not take into account the currency mismatch.

Banco Hipotecario del Uruguay (BHU), a state-owned mortgage bank, started in the second half of the 1980s to accept deposits in dollars, which became its main source of funding for unidades reajustables (UR) loans (the UR is a wage-indexed unit). While this further contributed to a rapid growth of credit, this growth was based on a mismatch of currencies. While the BHU assumed the risk directly in its own portfolio, for private banks currency risk became a part of their credit risk as they lent in dollars to agents with income in pesos.

Figure 7.2 shows the resulting increase in the currency mismatch across sectors, expressed as ratios to GDP. The accumulated currency mismatch grew steadily to reach 80 per cent just prior to the crisis. In terms of loans, close to 100 per cent of credit to the public sector and 70 per cent of credit to the private sector suffered from a currency mismatch, thereby setting the stage for severe solvency concerns for both banks and the public sector.

Banking for Argentinians

Traditionally, the Uruguayan banking system has accommodated the needs of Argentinians as well as Uruguayan customers. Based on banking secrecy and a tradition of stability and respect for deposits that contrasted sharply with that of

the Argentinian banking system, Uruguay was able to seduce Argentinian investors. As a result, deposits of Argentinians have been for decades a large part of the banking business in Uruguay.

Starting in the 1980s and mainly in the 1990s, these financial linkages led naturally to a process of branch creation by Argentinian banks in Uruguay, and by Uruguayan banks in Argentina. International banks also had branches in both countries. As a result, the potential for large cross-border risk grew in banks' portfolios. This risk was not addressed by Uruguayan regulation, leaving its management to the internal policies of individual banks.

Not surprisingly, the Uruguayan branches of private regional banks, as any bank with a presence in the Argentinian market, had a large exposure in their portfolios to both public and private credit in that country. Most affected were Banco Galicia, Banco Comercial and Banco de Montevideo-La Caja Obrera, all of which were among the top four private banks in Uruguay in terms of their total assets by the end of 2001.

The link between public accounts and the banking sector

By December 2001 there was an obvious link between the public sector and the banking system that derived from the fact that the state-owned banks accounted for over 40 per cent of total deposits. Besides BROU and BHU, the Corporación Nacional para el Desarrollo (CND) was the main stockholder of Banco de Crédito and Banco La Caja Obrera, two small banks whose survival was conditioned to the government guarantee.

At the same time, despite not having a proper risk-based capitalization of credit to the public sector, private banks did not have a significant exposure to the government in their asset portfolios. After the 1982 crisis, banking regulation forced banks to invest in Uruguayan bonds, as reserves. Over time, mainly after Uruguay entered the Brady Plan in 1991, this type of regulation started to ease, reducing the share of the banks' portfolios invested in credit to government.

However, the existence of an implicit deposit insurance and the legacy of two generations of bail-outs in banking crises crucially linked the health of the fiscal accounts and that of the private banking system.[7] Economic agents expected that, should anything happen in the banking system, the government would bail them out. This implicit guarantee, in turn, became a potential liability to the state. What nobody took into account was the vicious circle this would generate in the event of a real exchange rate shock when a sharp increase in the real value of dollars would damage the solvency of the banks. If the guarantee of the government were strong, the banking sector could avoid a run. However, due to the dollarization of public debt, the most likely scenario was one in which the sustainability of public debt would also become questionable. The result was a vicious circle in which the realization of potential liabilities in the banking sector could worsen public accounts, which in turn could erode the value of the implicit deposit insurance scheme, and deepen the run on the banking sector. If the shock were large enough, the capital of banks and the guarantee of the government could evaporate at the same time, leading to simultaneous runs on the banking sector and public debt.

The picture of Uruguay we have just depicted is one of both structural and short-term fragility. The country was fragile structurally due to liability dollarization. In the short term, fragility resulted from depressed expectations derived from the recession that started in 1999. Under this already problematic scenario, Uruguay was hit by a new shock: the Argentinian financial crisis of 2001–2.

7.3 Uruguay 2002: spill-overs, financial fragility and … contagion?

Asia, Russia and beyond: sudden stops and regional crisis

The financial turmoil generated by the Asian and Russian crises affected Uruguay through a reduction in Brazilian and Argentinian demand. Data on sovereign spreads show that, despite an initial reaction of the Uruguayan spread to the financial news coming from Asia and Russia, Uruguayan premia remained low (see Figure 7.3). In fact, after the Asian crisis, Uruguay intensified its strategy of maturity extension through global bond issues, a clear sign that financial markets remained open. Both Brazil and Argentina, on the other hand, showed clear signs of a reversal in financial flows (Calvo, Izquierdo and Talvi, 2002).

Fears of the abandonment of the Real Plan and the probable spill-overs to the region drove Uruguayan spreads above the 200 basis point mark by the end of 1998. Although the collapse of the Real Plan did generate a clear increase in Uruguayan spreads, this effect eventually faded during 1999. As a response to the crisis, the Uruguayan government changed the preannounced schedule of the crawling band, postponing indefinitely in April 1999 a 0.4 per cent per month

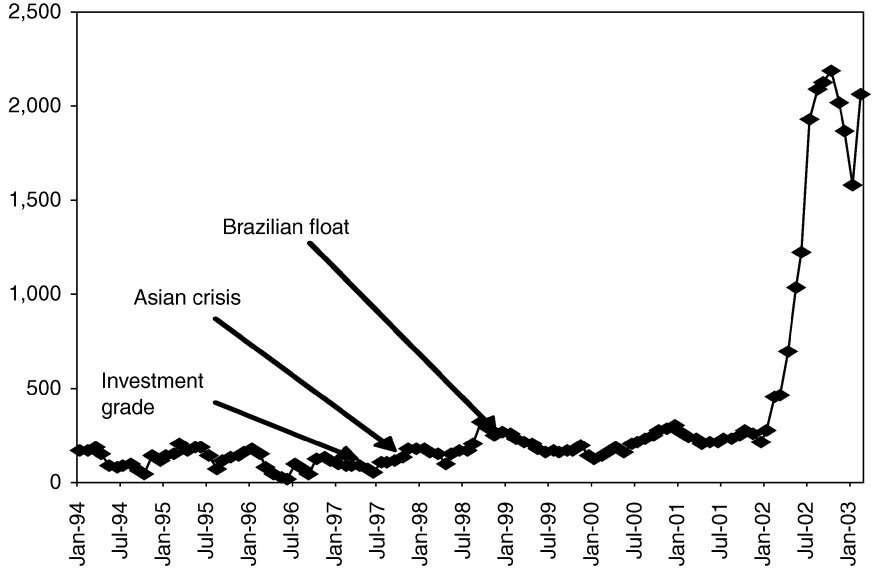

Figure 7.3 Uruguay country risk, 1994–2003 (in basis points)

reduction in the rate of crawl. With this measure, Uruguay managed to generate an 11 per cent dollar deflation in wholesale prices in 1999, and showed more flexibility than Argentina in the management of relative price adjustments.

As the likelihood of an Argentinian collapse rose,[8] Uruguay tried to adjust by allowing more room for relative price adjustment. By mid-2001 both the slope and the width of the band were doubled, to 6 per cent and 1.2 per cent per month respectively. Markets responded well to this increased flexibility. However, it became clear that a long-term fiscal adjustment was needed to ensure the sustainability of fiscal policy. Furthermore, some structural issues, such as the losses generated by the liability dollarization of the BHU's portfolio, became issues of public concern.

The relative price adjustment implied by the Argentinian crash meant that neither the financial sector nor the public accounts were any longer on a sustainable path. Thus, after the float of the Argentinian peso in early January 2002, the Uruguayan government decided to take two major steps. First, both the drift and the width of the band were doubled again, to 2.4 per cent and 12 per cent per month respectively. Originally scheduled to last until June, by early April it was determined that the measure would extend until December. In addition, a proposal for a $400 million fiscal adjustment was sent to Congress. It was expected that those two signals, together with a communication policy aimed at ensuring that institutions would be respected, would suffice to keep expectations aligned with the sustainability of public debt, and maintain access to international financial markets.

However, in the days that followed, those measures would prove to be totally inadequate. The spill-overs from Argentina, and the discovery of unlawful practices in Banco Comercial gave rise to the expectation that Uruguay would end up following in the footsteps of its neighbour.

The spill-overs from Argentina and the first stage of the crisis

After the enactment of the 'corralito' in early December 2001, Banco de Galicia (the Uruguayan branch of the Argentinian bank of the same name) started to lose deposits. Banco de Galicia's solvency was under severe scrutiny in Argentina, and depositors started to withdraw deposits from its branch in Uruguay, which was not limited by withdrawal ceilings under the 'corralito' (see Figure 7.4). By late December, rumours of delinquent risk practices at Banco Comercial triggered the run on the bank.

The first reaction of the Argentinian depositors was consistent with a 'flight to quality' inside Uruguay. The rest of the system, mainly public and international banks, gained deposits up to early February.[9] Private banks did not lose deposits until mid-January, when Standard & Poors changed the outlook of the Uruguayan rating to negative. Even then, deposits in public banks kept on increasing.

Although Banco de Galicia had built a strong liquidity position in Uruguay just prior to the crisis, by early February the bank was in serious financial difficulty, and unable to collect its assets from its headquarters in Buenos Aires due to the 'corralito'. On 13 February, the Central Bank of Uruguay suspended the operations of Banco de Galicia.

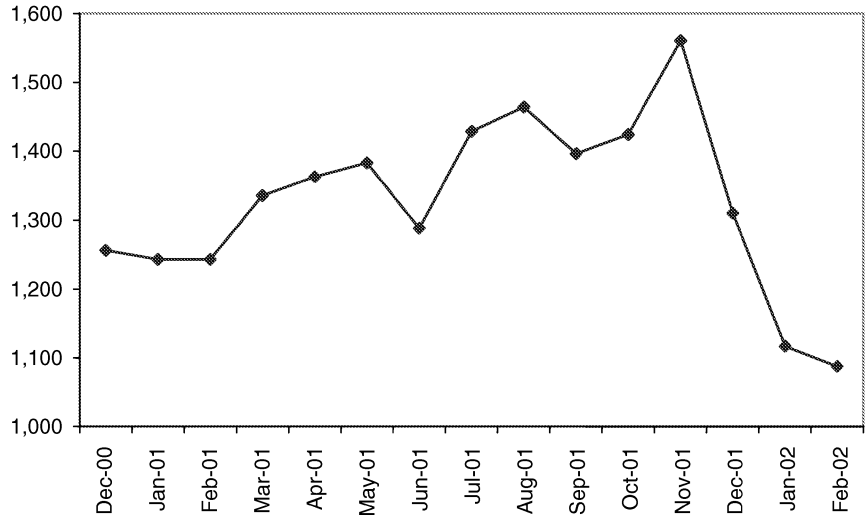

Figure 7.4 Banco de Galicia: total deposits, 2000–2 (in thousands of US$)

After this incident, four factors played an important role in the deterioration of the Uruguayan situation. First, Standard & Poors downgraded Uruguay below investment grade on 14 February. Second, the communication of the suspension of Banco de Galicia by the Uruguayan authorities was unclear, and conveyed the impression that Argentinian deposits were not being treated in the same manner as resident deposits. Third, the lack of information on the solvency situation of Uruguayan banks gave the impression that the problem was generalized. Finally, the Argentinian media, influenced by their national experience, announced that a 'corralito' had been introduced in Uruguay. By 14 February, the run on the banking system became a panic. As Figure 7.5 shows, there was a sharp acceleration in the rate of deposit withdrawals after 13 February.

The government responded by exerting political pressure on Congress to accelerate the approval of the fiscal adjustment, by augmenting the stand-by facility with the IMF, and by negotiating the 'capitalization' of Banco Comercial with its shareholders. The commitment to the exchange rate band was maintained. The government tried to give the impression that the problem in the banking sector was limited to the two banks already identified as being in trouble. In the case of Banco Comercial, which was the biggest private commercial bank measured by the size of its domestic assets, an agreement was reached between the government and its three main remaining stockholders (J.P. Morgan, Credit Suisse First Boston and Dresdner Bank), as a result of which each of the four parts contributed $33 million to capitalize the bank (a total of $133 million).

On 28 February, Congress approved a series of additional taxes, supporting the government's efforts to reduce the deficit. It was estimated that the tax measures would provide additional revenues of close to 0.8 per cent of GDP in 2002. Public services concessions would provide additional revenues of 0.3 per cent of GDP. On

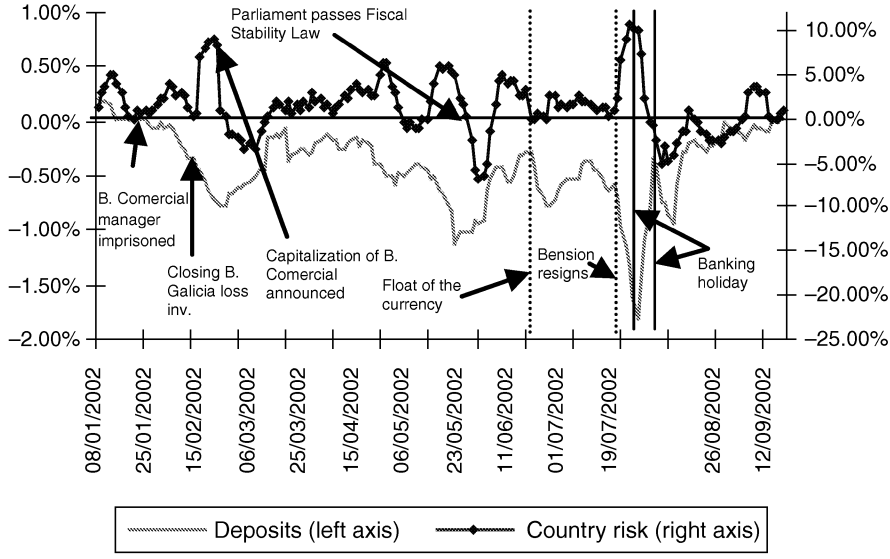

Figure 7.5 Uruguay: country risk and bank deposits, August–November 2002 (five-day moving average)

the other hand, non-interest expenditures were expected to fall by nearly 1.5 per cent of GDP.

On 25 March, the Uruguayan government signed a new stand-by arrangement with the International Monetary Fund in the amount of special drawing right (SDR) 594.1 million (about $743 million). The stand-by credit was intended to support the country's economic programme during 2002–4. Uruguay had already drawn SDR 122.6 million (about $153 million) from this facility.

Despite the significant reduction in the speed of withdrawals, these measures failed to stop the run for several reasons:

- Even after the fiscal adjustment law was passed on 28 February, the perception was that the *fiscal situation was not on a sustainable path.*[10]
- The *capitalization of Banco Comercial was rather obscure*. The press reported openly the disappearance of around $400 million from the bank's portfolio, while the 'capitalization' agreement was only for one-third of that amount. Furthermore, it took over a month for the money to arrive, thereby damaging the perception of commitment that was needed.
- *The new programme with the IMF was inappropriate* for three reasons. First, the amount involved in the programme seemed small compared to the loss of reserves ($550 million on average per month in January–February). Second, as will become clear in the second stage of the crisis, the traditional path of IMF disbursements is totally unfit to cope with the liquidity needs generated by a crisis such as the one experienced in Uruguay. Third, the IMF's willingness to

give decisive support to Uruguay became unclear after its abandonment of Argentina in November 2001.
- Finally, the government failed to disclose the strategy it was following to solve the problem, and showed clear signs of *lack of coordination and mismanagement of public communications*.

The financial crisis deepened in April and May, following the banking holiday in Argentina, the increasing rumours of a Brazilian default on its debt, the sharp downgrades in Uruguayan ratings by Moody's and Standard & Poors and a variety of comments in the press about the weaknesses of the banking system.

On the eve of the banking holiday

In early May, Uruguay started to negotiate a change of strategy with the IMF, based on the following principles:

- Transition to a floating exchange rate, with a monetary policy based on the management of monetary aggregates.
- Measures to restore confidence in the banking system, which should include:
  - restructuring of public banks.
  - creation of the Fund for Fortifying the Banking System (FFBS), a government agency in charge of both restructuring private banks and providing liquidity if necessary.
  - strengthening of the superintendence of financial institutions, particularly on the supervisory front.
- Improving the soundness of fiscal accounts both in the short and long run.

The measures for the banking system would be financed by the augmentation of the drawing rights of Uruguay to SDR 1152 million ($1.5 billion), and further financing from the World Bank and the IADB for an estimated $1.1 billion.

By the end of May, the announcement of the augmentation of the programme with the IMF had a visible impact on the financial situation. Country risk fell, and so did the speed of deposit withdrawals. The approval of the so-called 'Fiscal Stability Law' in an impressive one-week period contributed to an easing of the financial situation.

But two policy measures triggered panic once again: the float of the currency on 19 June, and the intervention of Banco de Montevideo-La Caja Obrera the day after. At the same time, Uruguay presented the letter of intent to be considered by the Board of the IMF. In the days that followed, the speed of deposit withdrawals would accelerate. A $500 million disbursement by the IMF evaporated in less than a week from the reserves of the Central Bank. The political support of the Uruguayan Executive crumbled as it became obvious that the mega-package with international financial institutions (IFIs) was not enough to solve the problem.

Increasing political pressure and the evident deterioration of the financial situation led to the resignation of the Minister of Finance, and the entire board of

the Central Bank on 22 July. A new economic team was put in place two days later. On the same day, a team from the Ministry of Finance, the Central Bank and the Office for Planning and Budgeting (OPP) flew to Washington to negotiate a new programme. The speed of withdrawals forced Uruguay into a banking holiday on 29 July.

The strategy underlying the June plan failed for several reasons:

- The float of the currency, designed to both preserve reserves and correct the relative price misalignment, was, to say the least, untimely:
  a) There was no pressure on the exchange rate market. After losing $100 million in early January, the Central Bank did not lose any reserves on the exchange rate market. Reserves fell due to the banking panic and the debt crisis.
  b) It worsened the lack of confidence in the banking sector. Since most of the credit in the banking sector was given to agents with income in pesos, it was now clear that banks would have to face a sharp increase in non-performing loans.
  c) It marked a focal point for debtors, who became conscious that the problem was generalized, and started to act as a pressure group. This moral hazard effect worsened credit risk and the balance sheet of banks.
  d) Since all public debt was in dollars, the float made it clear that the government was broke, severely questioning the capability of the public sector to further assist banks (public banks in particular).
  e) It was a clear sign of lack of control. A couple of months earlier the Minister of Finance and the president of the Central Bank had given an assurance that the exchange rate system would be maintained until the end of 2004.
- The intervention of Banco de Montevideo-La Caja Obrera, which may have been justified for supervisory reasons, was perceived as just the beginning of a series of interventions with an unknown end:
  f) The balance sheets of banks available to the public were more than nine months old, making it difficult to distinguish between good and bad banks.
  g) The commitment of international banks to the region was damaged by their reactions to the Argentinian experience.
  h) The public was aware of at least a couple of other institutions, those that would be closed later on, that could follow the same path.
  i) The problems of public banks were already notorious, and the public's perception of their liquidity was linked to the evolution of the international reserves of the Central Bank.
- Even though the size of the financing by the IFIs was rather large, the schedule of disbursements followed the traditional drop-by-drop IMF pattern, a procedure that neither fitted the needs to stop a banking panic nor gave confidence regarding the commitment of the IMF to the programme.[11]
- The timing of the enactment of the strategy was inadequate. The float was a precondition to the discussion of the plan by the IMF, introducing a lag between the implementation of the float and the introduction of the measures

in the banking sector. This prevented the presentation of the float and the banking measures from being perceived as being part of the same strategy.
- Despite the two fiscal adjustments, there were serious doubts about the sustainability of public accounts.
- Communications were also mishandled. It was unclear how the programme would be communicated so as to indicate that action was being taken to cope with the two main issues that had generated the financial collapse: the public debt and the banking crisis.
- The credibility of the economic team was damaged by the failure of its previous attempts to solve the problem.

7.4 Crisis resolution strategy

The August plan: rationale and implementation

The declaration of another banking holiday on 30 July and the implementation of the August plan meant a significant change in the government's strategy as regards the banking system. Instead of providing liquidity to try to keep financial institutions operating and – in some circumstances – injecting capital into them through the FFBS, the new strategy involved the use of all available financing to back only those deposits related to the payment system, leaving for a later stage the restructuring of the banking sector. This goal comprised: (i) the immediate suspension of the activities of the insolvent banks; (ii) the extension of the maturity of dollar time deposits in public banks (República and Hipotecario); and (iii) the preservation of the payment system, with full backing of sight and savings deposits (in local and foreign currency) in both the public banks and the suspended private banks. This last objective was implemented through the Fund for Stability of the Banking System (FSBS), filled with almost $1.5 billion secured through the support of IFIs.[12]

The design of the new strategy aimed at addressing the main determinants of the banking panic, and giving full backing, through the immediate availability of the resources of the FSBS, to the dollar-denominated deposits in the system that remained free (including the sight and savings deposits in the suspended banks).[13] The deposits in pesos in the public banks were supported by the Central Bank through a lender of last resort facility in domestic currency. To protect the payment system, the Central Bank was allowed to surrogate the rights of depositors in peso sight and savings deposits in the suspended banks.[14]

The up-front full backing of freed deposits, together with the reprogramming of time deposits in public banks, ensured the availability of sufficient liquidity to resist any further withdrawal of deposits in public banks, and to allow the reallocation of sight and saving deposits in insolvent banks. It was expected that deposit withdrawals in the other private banks, the 'good' banks, which in general met minimum dollar liquidity requirements and had positive net worth, would be met with their own funds or – in the cases of foreign subsidiaries and branches – would be backed by their headquarters.

The rationale behind this strategy was quite clear. To strengthen the confidence of economic agents in the Uruguayan banking system, the authorities designed a framework under which, even in the worst case scenario, the banking system would be able to withstand any withdrawal of deposits. This was an important first difference with the implementation and functioning of the previous FFBS, for which the amount of $2.5 billion was not immediately available and covered only a fraction of the deposits of the domestic banks, public and private.

This final effort by the Uruguayan authorities[15] to stabilize the financial system required a shock to expectations, involving not only the full up-front backing of the freed deposits – a necessary but not sufficient condition – but also the introduction of a firewall between 'good' and 'bad' banks in the financial system. This is a second important difference between the August plan and the original FFBS strategy. To improve expectations, it was necessary not only to improve the 'picture' through the full coverage of deposits at the end of the banking holiday, but also to establish consistent dynamics after 5 August. If insolvent banks had been allowed to continue operating, their economic imbalances would have undermined, sooner or later, the backing provided by the FFBS, triggering a new panic.[16]

Not only a firewall between 'good' and 'bad' banks was needed, but also between the funds devoted to crisis management and international reserves, which in turn introduced a separation between developments in the banking and the fiscal sector. Consequently, a third difference between the implementation and functioning of the FSBS and the failed FFBS lay in its constitution as an escrow account, separated from the international reserves. Through this mechanism, the support to the sight and savings deposits did not contaminate the management of international reserves, which under this new arrangement were completely devoted to backing the liabilities of the Central Bank with financial institutions and providing international liquidity for the servicing of external public debt.

The main risk of the August plan was the possibility that any of the private banks that reopened on 5 August could not resist a new wave of withdrawals. Such a situation could have arisen if local branches and subsidiaries had lacked support from their headquarters or if the remaining national banks, mostly cooperatives, had faced a liquidity shortage. However, this risk seemed relatively small when compared with the commitment to Uruguay demonstrated by international banks.[17] Moreover, the Central Bank minimized this risk by being quite restrictive as regards the conditions imposed on banks for their reopening.[18] According to data that was made publicly available a few days after the end of the banking holiday, there was a clear distinction in terms of solvency and liquidity between the banks that continued operations after 5 August and those that were suspended.[19]

To contribute to the strengthening of liquidity in the banking system, the Central Bank increased the legal reserve requirements, first imposing a 100 per cent marginal requirement on the increase of deposits, effective in August, and later (in September) transforming this requirement into an increase in the average requirement.[20] Reserve requirements were raised both for dollar and domestic currency deposits, the latter being justified for monetary policy reasons.[21]

Another regulatory change, effective as of September 2002, was the introduction of liquidity restrictions on non-resident deposits. Before this date, regulations only established a single reserve requirement for all dollar deposits, the only exception concerning deposits obtained abroad by the bank, in which case no minimum reserve was applied. The illiquid nature of many assets funded by non-resident deposits in the cases of the banks that would eventually fail, especially after the introduction of capital controls in Argentina, explains the difficulties they faced at the very start of the panic. The new regulation did not introduce minimum reserve requirements for non-resident deposits originating from abroad, but required that at least 30 per cent of those funds be placed in high-quality instruments. Additional regulations, to be introduced later on, would take into consideration the country and operational risks that were also present in the banks that failed during the crisis of 2002.

The August plan was designed not only to effectively stop the withdrawal of deposits but also to promote the recovery of the banking sector, as well as that of the Uruguay economy. For that reason, the protection of the payment system, even under the great pressure resulting from the closure of four national banks, was a cornerstone of the new strategy.[22] The access of public banks to the resources of the FSBS was relatively easy to implement and control, but the transfer of the funds in sight and saving deposits in the suspended banks was a tough and overwhelming task. Obtaining a valid note to be deposited in a bank of the depositor's choice, or a limited amount of cash in some cases, required the involvement of thousands of people through the windows of the suspended banks. Despite the lengthy queues of depositors asking for their funds at the suspended banks, the procedure was completed safely in a relatively short period.[23]

The task that remained after stopping the run was the resolution of the suspended banks. A conventional bankruptcy process involving almost $2 billion of assets would have been overwhelming, very risky for the maintenance of the payment system and costly for the economy as a whole. Some attempts were made initially to obtain the commitment of the private shareholders of Banco Comercial and Banco de Crédito towards their recapitalization. The possibility of turning other investors and depositors into shareholders was also explored. However, the large amount of non-performing loans made it impossible that any of the suspended banks could be viable on its own.

Efforts where then rechannelled into a legal reform that allowed:

- The setting up of some sort of asset management company (AMC), able to perform financial activities and putting together the performing credits of Banco Montevideo, Banco Caja Obrera and Banco Comercial.[24] The AMC was authorized to operate as a bank, named New Banco Comercial (NBC).[25] The NBC opened to the public in March 2003, with total assets of $1 billion and a net worth of $150 million, in full compliance with the regulations of the Central Bank.
- The transfer of remaining assets of Banco Montevideo, Caja Obrera and Comercial were transferred to 'liquidations funds', following a legal framework

created in December 2002 (similar to a trust indenture) that allowed the Central Bank to manage distressed assets under much more flexible rules than those applied in usual bankruptcy procedures, thereby preserving their value and that of the businesses related to them. A similar procedure was applied to Banco de Crédito, when the Central Bank decided to liquidate it in February 2003, once their private shareholders refused to recapitalize it. The 'beneficiaries' in all of these liquidation funds were the former creditors of the failed banks, whose rights were allowed to be traded in the market.[26] The Central Bank outsourced the management of all the liquidation funds to private parties in 2004.

Early results

The daily outflow of dollar deposits of the non-financial sector in the banking system in the five working days before the banking holiday averaged $130 million. On 5 August, the first day after the holiday, the outflow of dollar deposits reached $136 million. The next day, another $119 million left the banks. But by the last day of the week, withdrawals dropped to $25 million. On Monday, 12 August, a week after the reopening of the banks, the reduction of non-financial sector dollar

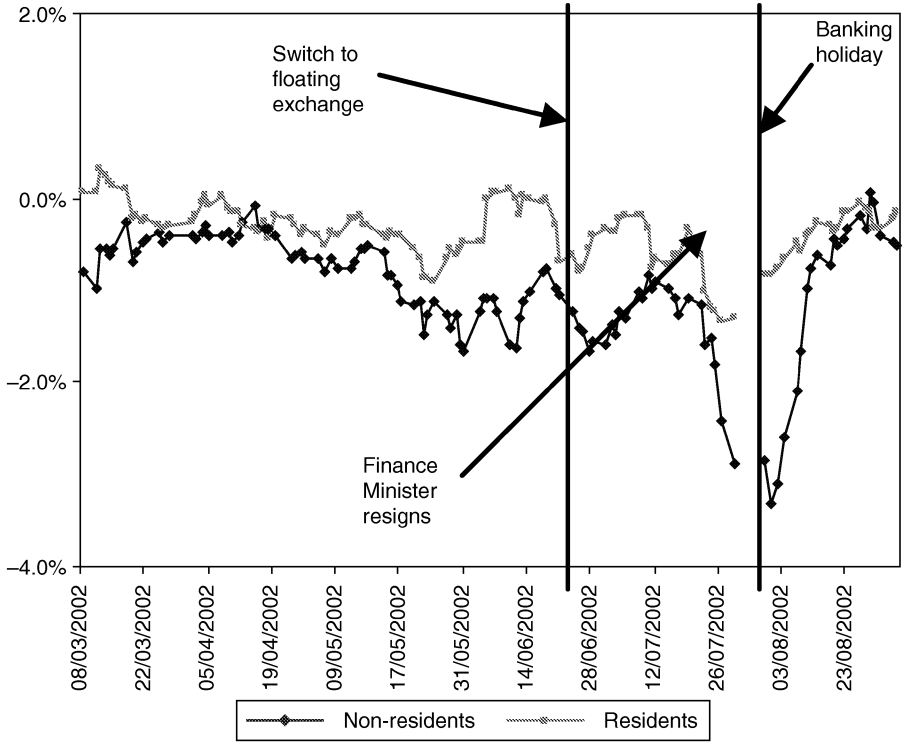

Figure 7.6 Uruguay: rate of change of bank deposits, March–November 2002

deposits was only $14 million. On 22 August, deposits finally increased, after months of reductions, and, on 27 September, a whole week with a positive daily average was finally recorded for the first time since the beginning of the nightmare.

Uruguayan residents reacted more promptly to the new strategy; in this case, the run on dollar deposits effectively stopped in the first week of September. However, non-residents reacted more cautiously and withdrawals continued, with some ups and downs, until the second half of October. Figure 7.6 shows the five-day variation of resident and non-resident deposits in the banking system, revealing a clear break in the behaviour of economic agents after the implementation of the August plan. However, until the new measures were implemented, the increase in deposits would remain far below the huge drop that had been suffered.

It is important to stress, at this point, that the reversal in the flow of deposits only accelerated after the restructuring of public debt in May 2003, as can be easily seen from Figure 7.6. The same chart shows that another episode of deposit withdrawals took place during the last week of January and the first week of February 2003, revealing that the August plan only allowed for a first victory in a long war, the end of which was still uncertain.

Other indicators support the notion that the August plan had only been the first step in the comeback from hell. The sentiment of economic agents as regards the banking system can also be captured through the evolution of the interest rate for dollar time deposits and its spreads over international rates. As Figure 7.7 indicates, the interest rate paid by banking institutions for dollar time deposits and its spreads stabilized and began to decrease as the effects of the August plan became more apparent. But only after the closing of the debt swap in May did the drop in interest rates and the spreads become more pronounced.

A distinctive feature of bank liabilities in the post-crisis period is the shortening of their maturity, due to their strong concentration in sight and saving deposits (see Figure 7.8). This preference of depositors for short-term financial assets is a vestige of

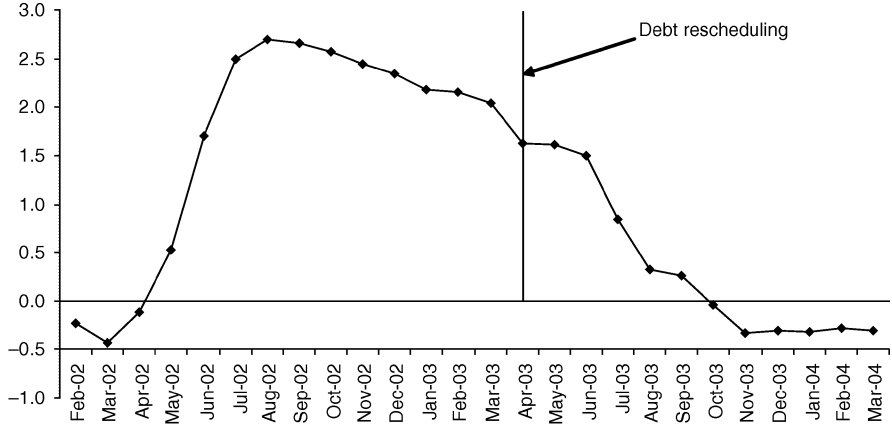

Figure 7.7 Uruguay: spread between LIBOR and the deposit rate, 2002–4

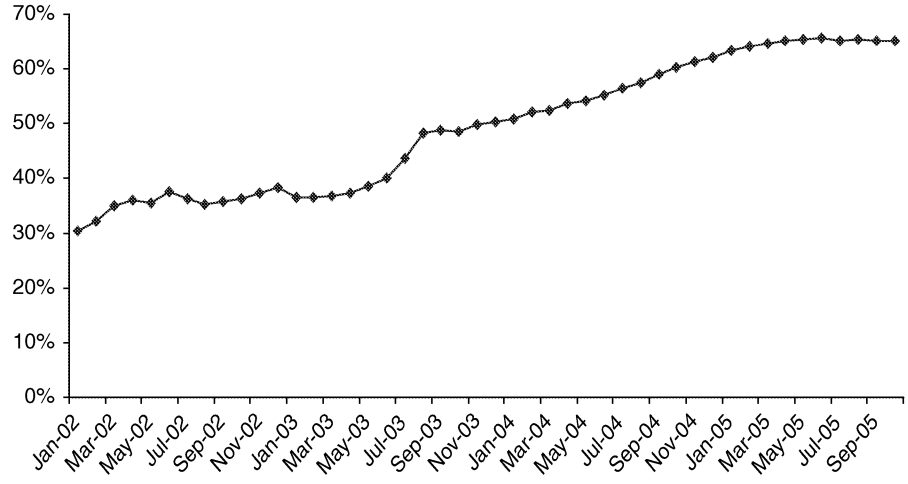

Figure 7.8 Uruguay: share of sight deposits in the banking system, 2002–5

their behaviour during the crisis and probably reflects the persistence of some uncertainty about the soundness of the financial system. Moreover, the exit strategy from the crisis benefited short-term deposits by protecting the payment system. Given that experience, depositors may arguably have come to believe that sight accounts, in particular, will deserve greater support from the government in the future.[27]

Finally, the August plan also helped to stop the drain on the international reserves of the Central Bank. After reaching $554 million on 14 August, international reserves began to increase gradually to a level of around $700 million, mainly supported by the increase in the deposits of the banking system in the Central Bank. Nevertheless it was not possible to maintain this source of financing indefinitely. The counterpart of the international reserves borrowed from the banking system to meet public sector obligations is a reduction of the international reserves backing of Central Bank liabilities with the banking system. In fact, dollar deposits of financial institutions in the Central Bank exceeded international reserves by more than $300 million by the end of September. In February 2003, this figure had worsened to close to $800 million.

The exchange rate jumped to $32.4 on 16 September 2002 in part as a result of problems in the microstructure of the foreign exchange market. To alleviate the extraordinary pressure on the market that was resulting in an acceleration of the devaluation of the peso, the Central Bank implemented in September a series of non-delivery forward contracts with Banco de la República to move the purchases of dollars required to sustain the net position in foreign currency of the latter towards December. After the non-delivery forward contracts were implemented, the exchange rate fell by 10 per cent over the next 40 days.

The fragility of the situation became evident by the end of January 2003, when, amid rumours of pesoification of the Uruguayan debt and/or dollar deposits, an

intense but fortunately short-lived run was triggered. It is worth noting that the implementation of the FSBS as an escrow account separated from international reserves proved to be effective to isolate international reserves from developments in the banking sector.[28] In any case, the summer 2003 run showed that a gap in terms of credibility still needed to be filled.

The following two sections concentrate on the analysis of monetary policy and the public debt swap, explaining how they complemented the August plan in the normalization of the Uruguayan financial system and allowed the resumption of growth. It is important to note here that stopping the bank panic, stabilizing the financial system and restructuring the debt were all necessary for Uruguay to emerge from the crisis. However these issues needed to be dealt with sequentially. Three arguments lay behind the sequential approach:

- The assessment of debt sustainability is heavily distorted if actual relative prices are far from equilibrium, a situation that is quite characteristic of a period of great turbulence. Stopping the run, regaining control over inflation and stabilizing the exchange rate became prerequisites for a realistic assessment of the intertemporal solvency of the public sector, which is the basis for a sound debt management policy.
- The Uruguayan authorities placed great emphasis on addressing the debt problem under a cooperative approach with investors, hoping to create the basis for a fast return to market access. Avoiding a default until the debt was effectively restructured was a major difference compared to the Argentinian approach and a sign of good faith. However, this strategy implied that the restructuring of the debt should not be implemented in a period of heavy debt service, because the uncertainties surrounding this transaction could trigger capital outflows, facilitated by the payments of the government. Given the importance of the deposits of the banking system in the Central Bank as sources of fund, it was considered important, to prevent capital outflows, that debt service should be made under a favourable climate.
- The Uruguayan authorities were concerned about the negative effects that a default on the public debt or a non-friendly restructuring proposal could have on the deposits in the banking system, particularly in public banks.

The role of monetary policy

The jump in the exchange rate that followed the decision to float strongly impacted prices. The annualized inflation rate in the third quarter of 2002 was 71.5 per cent, following a cumulative total of only 6.5 per cent in the twelve months through May. A new nominal anchor had to be introduced to stop inflation and restore stability in the foreign exchange market.

Despite the noise introduced by the modification in the monetary regime on 20 June, the level of international reserves left after the banking holiday (around $600 million) was completely insufficient to sustain a credible return to a crawling peg regime, even with the flexibility of a broad target zone. The use of the exchange

rate as nominal anchor was ruled out, notwithstanding it being the most efficient instrument to reduce inflation in a highly dollarized open economy, and an active monetary policy was implemented based on the control of money aggregates.

Three stages can be recognized in the implementation and operation of the new monetary policy framework. The first, basically a test period, corresponds to the last four months of 2002. During that period, the central banks tightened monetary policy and tried to develop a market for peso-denominated instruments, which consisted mainly of short-term Treasury bills (TB). Efforts were also made to place the first inflation-indexed notes, using the recently created indexed unit (IU). These notes were issued by the Central Bank for monetary control purposes, trying to absorb the excess liquidity left in the market from the access granted to depositors to their peso sight and saving deposits in suspended banks.[29] The monetary tightening was supported by an increase in legal reserve requirements for peso deposits (to 30 per cent in the case of sight deposits, up from 20 per cent).

Monetary tightening curbed the rise of inflation observed in the third quarter of 2002. The annualized increase in consumer prices in the fourth quarter was 11 per cent, much lower than the 71.5 per cent registered in the third. During this first stage, stabilization of the exchange rate was achieved[30] and the interest rate for the TB was halved from above 150 per cent in September to a still high 60 per cent by year-end. During this period, the Central Bank satisfactorily tested its ability to meet the monetary base targets.

Given this progress, the Central Bank announced its targets for the monetary base for the following year, 2003. During this second stage, the monetary target was established assuming an inflation rate of 27 per cent for the year. However, the improvement in the macroeconomic environment after the debt exchange determined a higher demand for money than that originally envisaged. The debt swap lowered the expectations of foreign currency needs for the public sector, leading economic agents to revise their expectations of currency devaluation downward. Together with the lower expected depreciation, interest rates in pesos collapsed to below 20 per cent, down from the 60 per cent level observed at the beginning of the year.

Lower than expected devaluation and interest rates, a better growth performance and the absence of significant pressures on wages and prices of non-tradable goods, given the excess capacity of the Uruguayan economy at the time, led to better results for inflation than those assumed in the programme: 10.2 per cent, against the 27 per cent originally projected. Nonetheless, the Central Bank kept its monetary base targets unchanged, and seized the opportunity to reduce legal reserves for peso deposits below the requirements for deposits in dollars, consistent with a proper evaluation of risks in the banking sector.[31]

Building on the credibility obtained after the first year of application of the new monetary regime, the Central Bank took another important step in 2004, changing the priority of monetary policy. Instead of adhering strictly to a monetary target, it started to stress the fulfilment of an inflation target, revising its monetary targets when needed. Under this scheme, at the end of each quarter the Central Bank now announces the inflation target for the following twelve months, changing if necessary the targets announced at the end of the previous quarter.

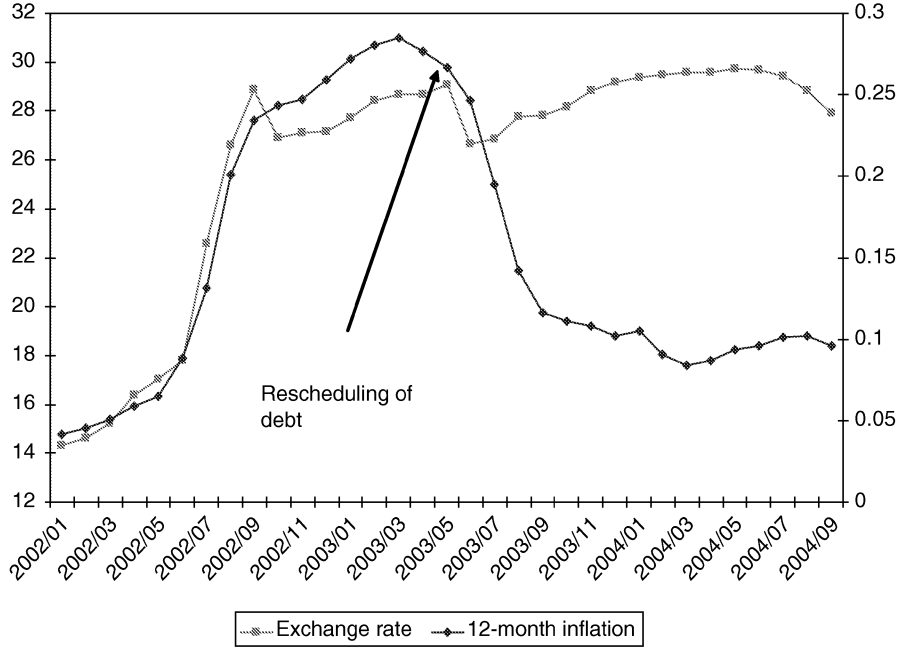

Figure 7.9 Uruguay: exchange rate and inflation, 2002–4 (in per cent)

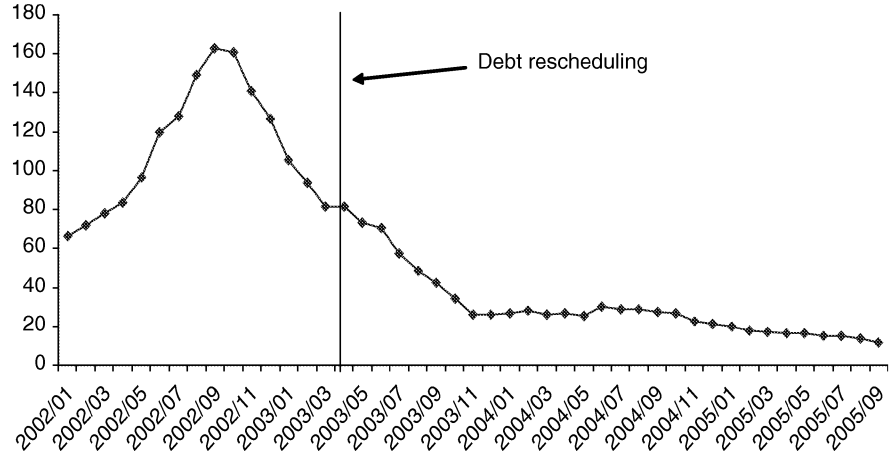

Figure 7.10 Uruguay: short-term peso interest rate, 2002–5 (in per cent)

Figures 7.9 and 7.10 show that, even with the inconveniences noted above about the accuracy of a monetary policy based on monetary base targets, the Central Bank has succeeded in stabilizing inflation and changing expectations on key financial variables, such as the exchange rate and the interest rate. In turn, a more stable environment in the exchange market opened the door to

foreign exchange purchases by the Central Bank aimed at rebuilding its net position in foreign currency, which had seriously deteriorated in the third quarter of 2002.[32]

Debt restructuring

Stopping the bank run and rebuilding the financial system were only the first steps to address the fragilities of the Uruguayan economy. The substantial jump in the debt-to-GDP ratio after the devaluation of the peso (from 54 per cent in 2001 to 92 per cent in 2002) changed the fundamentals of debt dynamics. The high concentration of debt amortizations, the sudden stop in the access to capital markets and the reduced level of international reserves introduced a financial gap starting in the fourth quarter of 2002 and thereafter, which contributed to the perception of many analysts, investment bankers and rating agencies that the Uruguayan debt had entered an unsustainable path.

In August 2002, the authorities agreed with the IMF a sort of 'private sector involvement' in the resolution of the debt problem, which would be finalized before the conclusion of the Second Review of the programme with the IMF, scheduled for October. But the goals of the Uruguayan government regarding debt restructuring did not seem to be consistent with the diagnostic that the IMF had in August 2002 about public debt dynamics. The debt outlook had deteriorated sharply since June, basically due to the increase of the Uruguayan debt with IFIs after the bail-out of August and the sharp depreciation of the peso after the float. With that perspective in mind, the IMF staff was reluctant to conclude the Second Review of the programme and to accept a proposal of debt restructuring formulated under the assumption that the problem with the Uruguayan public debt was merely a liquidity issue.[33]

The different views about the appropriate strategy to deal with the debt problem delayed the conclusion of the Second Review towards the beginning of 2003, when the improvement in macroeconomic conditions, paired with the sense of urgency that the summer run on the banking sector brought about, facilitated a convergence of views on debt sustainability and the magnitude of the financial gap in 2003–5.[34] In February 2003 the Fund agreed to support a comprehensive debt exchange, the main elements of which were:

- Voluntary participation of bondholders in the debt exchange, based on the expectation of market-value recovery associated with the improvement in the Uruguayan capacity to pay.
- Inclusion of all dollar-denominated bonds as eligible, except for short-term instruments issued since January 2003. This amounted to $5.4 billion of principal, of which: (i) $1.6 billion were domestically issued bonds; (ii) $3.5 billion corresponded to international bonds issued under foreign law; and (iii) $250 million were one bond issued in Japan.
- Uruguay should remain current on all its financial obligations until the closing of the exchange.
- A consultation process with bondholders should precede the launching of the offer, during which the terms would be determined. The authorities saw this consultation as an important element in their approach.[35]

- The support of the IFIs would be needed, including an initial disbursement from the IMF devoted to rebuilding international reserves and preventing any disruption in the financial system after the announcement of the debt exchange.

A key risk factor of the Uruguayan approach was the level of participation in the debt exchange. One of the main concerns of the IMF with the voluntary approach was the apparent limited incentive of bondholders to participate voluntarily in a debt restructuring due to coordination problems in collective action (Krueger, 2003). But as de Brun and Dellamea (2003) show, the hold-out problem is usually overstated. If the debt restructuring adds value to bondholders in relation to recovery values in the event of default, very high values of the probability of continuing servicing the debt must be assigned to make the decision to hold out a rational one. Moreover, if the debt exchange is perceived to be difficult, bondholders will be induced to participate, expecting favourable treatment even if the transaction fails.[36]

The communication strategy of the Uruguayan government emphasized the commitment of the authorities to complete the exchange only if 90 per cent participation was reached. To encourage participation, moderate use of the exit consents and regulatory incentives for domestic financial institutions were introduced. The exit consents were designed basically to protect the payments under the new bonds from eventual legal actions of hold-outs and to establish a structure in which the 'old' bonds would be considered as subordinated debt in relation to the new bonds. The regulatory changes served a similar purpose in the case of the bonds issued domestically. Besides, the exit consents and the regulatory changes reduced the liquidity of the 'old' bonds that would remain outstanding, eliminating the requirement of public listing of their prices in both domestic and international markets.

The exchange offered bondholders two options, both involving approximately a par-for-par exchange:

- *Maturity extension option*, which proposed to change only the maturity of bonds (generally adding five years).
- *Benchmark bond option*, which proposed the exchange of existing bonds for 'benchmark' bonds, longer dated than the maturity extension bonds but with higher amounts outstanding, offering more liquidity in secondary markets. Three external and four domestic benchmark bonds were introduced. With the reopening of the 2011 benchmark bond, made a couple of weeks after the closing of the exchange, the three external bonds were large enough to be included in the Emerging Market Bond Index (EMBI).

A legal innovation of the new bonds was the introduction of collective action clauses (CACs) with an aggregation clause. Given the scope of the transaction, after the debt exchange almost all the Uruguayan market debt issued in international markets contains this instrument.[37]

Back from hell

In the event, the participation rate was finally 93 per cent, 99 per cent in domestic bonds (see de Brun and Dellameas [2003], for more details on the transaction). The success of this transaction brought visible benefits to the development of the Uruguayan economy in the immediate future. Confidence in the financial situation improved and dollar-denominated deposits in the banking system began to increase at a faster pace than that observed in previous months. The confidence of consumers and investors also improved, and domestic private absorption began to fuel aggregate demand, adding to the role played by exports in the first half of 2003. As a result, GDP grew at double-digit figures in the second half of 2003, a trend that would continue during 2004.

The resumption of domestic consumption and growth helped to improve the fiscal numbers, allowing the primary surplus to rise from 0.2 per cent of GDP in 2002 to 2.9 per cent in 2003. The better outlook for Uruguayan debt, as shown in Figure 7.11, where the amortization schedule before and after the exchange is shown, together with the economic recovery and the consolidation of the fiscal situation, allowed for a collapse in the Uruguayan spreads and a fast return to international markets. In October 2003, Uruguay was the first emerging country in many decades to issue an international bond denominated in domestic currency.

The restored confidence was reflected in a resumption of capital inflows, inducing a reversal of the overshooting in the exchange rate and facilitating a

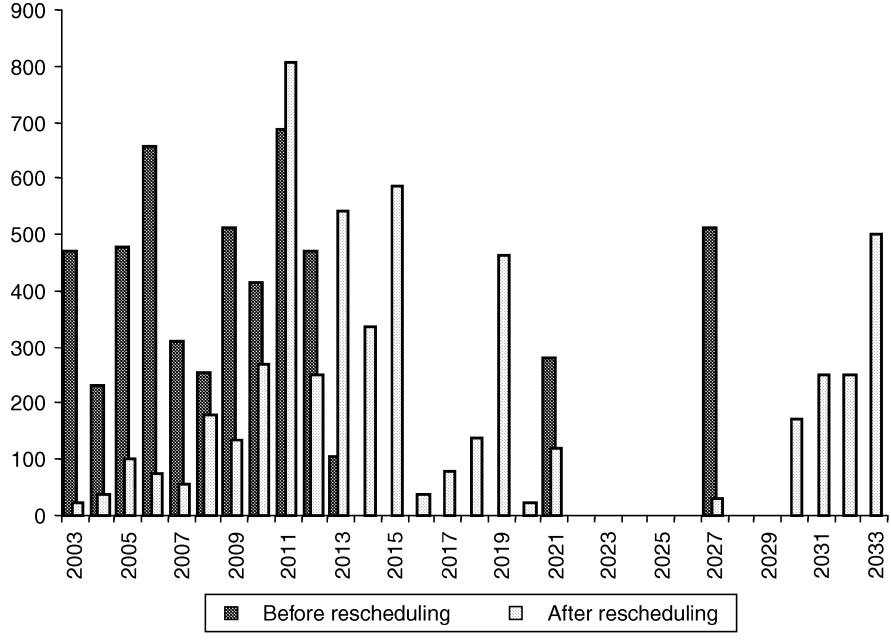

Figure 7.11 Uruguay: maturity profile of the domestic and external public securities (in $millions)

pronounced reduction in domestic interest rates. Those developments allowed a rapid increase in international reserves, closing the sold position in foreign currency and the gap between the reserves and the obligations in foreign currency of the Central Bank with the financial system. The stabilization of the financial system brought with it an increased margin of manoeuvre to the Central Bank, facilitating the operation of the new instruments of monetary policy. The market for fixed-rate notes issued by the Central Bank, as well as longer-term instruments such as inflation-indexed notes, deepened. A gradual process of de-dollarization of the public debt had started.

7.5 Lessons

The recent experience of Uruguay allows us to draw a rich set of lessons ranging from structural reforms in the safety net of the financial system to the day-to-day management of a financial crisis.

Structural issues

We have identified a set of structural factors that could either be identified as causes of the crisis or propagation mechanisms.

1. Problems in the design of the safety net of the banking system led to financial fragilities that fostered the crisis. First, the existence of guarantees both on the exchange rate (target zone) and on deposits (implicit deposit insurance) gave wrong incentives for risk evaluation. The implicit deposit insurance scheme also generated a link between public debt sustainability and the soundness of the banking sector.
2. The regulatory framework, in particular regarding liquidity risk, favoured the foreign currency.
3. There was no regulatory treatment of cross-border risk that could prevent risk-taking behaviour by regional banks in Argentina.
4. Dollarization prevents a fair evaluation of the fiscal stance for several reasons. First, when the debt is in dollars, usual indicators of debt sustainability can be biased. In particular, if the real exchange rate is below its long-term equilibrium, the debt to GDP indicator underestimates the real indebtedness of a country. The fiscal flows are also misleading. We have shown that interest payments are a very important part of the pro-cyclicality of fiscal policy in countries with dollarized public debt. As the real exchange rate is pro-cyclical, the burden of interest payments goes down both because nominal payments are reduced following falls in spreads and the real value of those payments is lower with a cheaper dollar.

Banking crisis

Once a run starts, there is a need for an early assessment of the sustainability of banks and public debt. To provide a prompt response it is necessary to have a coordinated intervention from both the IMF and domestic institutions, like the

Central Bank. While domestic institutions are able to identify the problem early on, the political system is biased towards thinking that problems are smaller than they really are, thus delaying the design of a resolution strategy. The IMF can play a role in adding a 'sense of urgency' derived from its experience in crisis management.

To restore confidence, a full-fledged strategy has to be clearly communicated to the public once the extent of the crisis has been identified. We have shown that the slow response of the government in the Uruguayan case, as well as the lack of coordination in the resolution strategy in the first two failed attempts, damaged the credibility of very large assistance plans.

While it is difficult to get involved in a de-dollarization strategy with a pegged exchange rate regime, the switch to a floating exchange rate regime in a dollarized economy is also full of challenges if it is made in the midst of a financial crisis, with expectations playing a crucial role. With large currency mismatches in both the public and private sectors, a sharp depreciation of the currency worsens the perception of the sustainability of both the financial system and public debt. Furthermore, the regime switch accompanied by a 'jump' in the exchange rate operates as a coordination device for moral hazard on the part of debtors, whose lobbying activities can only further deteriorate the soundness of the banking sector.

There are also several important lessons from the Uruguayan crisis as regards LOLR in small dollarized economies. First, it has been proven that IFIs can provide the needed liquidity assistance, effectively performing LOLR responsibilities with no significant problems of moral hazard involved. Second, it is clear that, since domestic central banks cannot issue dollars, liquidity requirements should be higher in dollars than in pesos. Third, if the central bank performs LOLR functions in dollars with its own international reserves, a perverse link between public accounts and the financial system is created. The Uruguayan episode shows how the fall of international reserves, due to their visibility, can promote herding by depositors. Finally, if the IMF takes on the function of provider of LOLR support in dollars, the assistance has to be up front and cannot follow the usual drop-by-drop disbursement pattern of the standard stand-by programme.

While restoring debt sustainability is essential in these situations, the bank run must be stopped first before the extent of the shock on the sustainability of public debt becomes apparent. In the middle of banking panics, issues such as the path of potential GDP, the equilibrium real exchange rates and the fiscal deficit are extremely hard to assess. As a consequence, the sustainability of public debt cannot be assessed properly. Rushing the restructuring of public debt may thus lead to a new renegotiation in the future, promoting long-term fiscal uncertainty.

In the long term, the legacy of the Uruguayan crisis is one that stresses the role of institutional stability. Through the roughest of times, the normal working of institutions was not interrupted. Private contracts were respected, the Charter of the Central Bank, particularly with respect to inflationary finance, was not breached, and political stability was preserved. The fast recovery of the Uruguayan economy seems to favour the strategy that was followed. However, the question

remains as to whether more aggressive policies should have been followed, particularly on the fiscal front.

Notes

1. We would like to thank Fernando Barrán, Josá Antonio Licandro, Daniel Dominioni, Umberto Della Mea, Eduardo Levy Yeyati, Alain Ize and the participants at the April 2005 Lima conference for their comments, and Margarita Güenaga for her valuable research assistance. Any remaining errors are our sole responsibility.
2. Using the Mercosur as a 'bridge' for increased participation in world trade was a declared objective of the authorities of all Mercosur countries at the beginning of the process. For the Uruguayan government, it was also a means of consolidation of the unilateral openness that the country had been implementing since the mid-1970s.
3. The Uruguayan exchange rate-based stabilization plan drove inflation to single-digit figures in 1998 from the record-breaking 130 per cent registered in March 1990 (Fernández, 1997; Licandro, 2003). This focus on inflation stabilization went institutional in 1995, when the Congress passed the Charter of the Central Bank, which explicitly established the commitment to achieve stability in the value of the Uruguayan peso and limited the capability of financing the central government.
4. See Favaro and Sapelli (1986), Bergara, Dominioni and Licandro (1995) and Masoller (1998).
5. See Saldain (1996).
6. In 1998, the Central Bank of Uruguay, in an attempt to slow down the rapid growth of credit, increased the capital requirements of banks from 8 to 10 per cent.
7. See Bergara and Licandro (2000).
8. For a detailed description of the Argentinian crisis see de la Torre, Levy and Schmukler (2002) and Calvo, Izquierdo and Talvi (2002).
9. Even though the panic was generalized, some elements of market discipline were present throughout the crisis. See Goday, Gruss and Ponce (2005) and Levy Yeyati, Martínez Pería and Schmukler (2004).
10. The reports of the rating agencies stressed this point. Standard & Poors' downgrade in early February was based on that premise rather that on the existence of a bank run, which remained widely unknown at that juncture.
11. The Argentinian experience in 2001 showed that the IMF could just cut the financing at any point.
12. To reopen the banks on 5 August, before the IMF's Board gave final approval of the programme, a $1.5 billion bridge loan from the US government was secured.
13. According to data available at that time, at the beginning of the banking holiday, on 30 July, sight and savings dollar-denominated deposits in BROU and BHU were $1,040 million, while $406 million stood for the sight and savings dollar deposits in the suspended banks Comercial, Caja Obrera, Montevideo and Crédito.
14. The authorization to the Central Bank to surrogate the rights of certain depositors against the suspended banks was given by Law 17523. That Law also created the FSBS, authorized the Government to make advances to dollar-denominated sight and saving deposits in the suspended banks and established the reprogramming of the dollar time deposits in the public banks by up to three years. Peso time deposits were not rescheduled.
15. The difficulties faced by the Uruguayan government in obtaining an agreement from the IFIs, especially the IMF, on an augmentation and acceleration of disbursements to finance the plan reflected the reluctance to continue putting money into Uruguay to finance the capital outflow.
16. It is important to stress this point because it explains why the authorities did not back the sight and saving deposits in the Comercial, Caja Obrera, Montevideo and Crédito banks (and, eventually, the cooperative Caycu) and consequently proposed to the Congress the reprogramming of their time deposits as in the case of the public banks, instead of suspending and later liquidating those banks, financing the transference of

the sight and saving deposits through the FSBS. None of the suspended banks was viable by itself at that time, although in terms of the liquidity available both alternatives would have offered the same support for the freed deposits.

17. The support given by the headquarters of the local subsidiaries and branches in the case of Uruguay contrasts with their behaviour in Argentina and is explained, in great part, by the different strategies adopted by those countries when facing the crisis.
18. Besides the ailing banks Comercial, Montevideo, Caja Obrera and Crédito, a small cooperative with negative net worth and no liquidity, Caycu, was also suspended.
19. Information releases on the balance sheets of banks improved, though a two-month lag still remained.
20. In the case of the dollar sight deposits, the minimum reserve requirement was raised from 20 per cent to 25 per cent of deposits. For longer maturities, a 5 per cent average increase was also applied.
21. In fact, the initial increase in the reserve requirements for peso-denominated deposits was higher than the one applied to foreign currency deposits. For peso sight deposits, the legal requirement was raised to 30 per cent from 20 per cent, effective September 2002. After the normalization of operations, the requirement was reduced so as to eliminate the currency blindness of liquidity regulation.
22. The four banks suspended represented, at the time of the banking holiday, nearly 30 per cent of sight and saving deposits outside the public banks.
23. Audits conducted subsequently on the uses of resources of the FSBS showed very little deviation from its scope.
24. Some non-performing credits that had good collateral or good prospects of being collected given the economic prospects of the debtor were also included. To enhance the solvency of the NBC, the offer included a put option that gave the NBC the right to return to the liquidated banks all the loans that would remain non-performing by the end of December 2003.
25. The bank would later on be privatized. The seed capital of the NBC was constituted by the loans used as collateral of the financial assistance given by the government to the distressed banks through the FFBS. To isolate the NBC from legal contingencies affecting the liquidation of the suspended banks, the 'good assets' were auctioned. NBC would finally be the only bidder. The proceeds of the auction were distributed among the creditors of the failed Banco Montevideo, Caja Obrera and Comercial, including the state. The government, with the authorization of a law passed in December 2002, redistributed its share of the proceeds among the depositors, allowing the full recovery of the time deposits up to $100,000. The sight deposits were fully recovered by depositors through the Fund for Stability of the Banking System, created in August 2002.
26. In fact, the transactions were mostly made over the counter.
27. Low international interest rates might have had an impact, too.
28. Deposit withdrawals between 29 January and 6 February amounted to $355 million, while, in the same period, international reserves of the Central Bank dropped only $43 million, mostly due to foreign currency obligations of the public sector.
29. Almost $1.7 billion was issued in August for this reason, representing 20 per cent of the currency in pesos outside the Central Bank.
30. After peaking to $32.35 on 10 September, the dollar oscillated in the $27 area until year-end.
31. In the case of peso deposits, the possibility that the Central Bank would become a lender of last resort always existed (Broda and Levy Yeyati, 2003).
32. The net sold position in foreign currency of the Central Bank increased from $158 million at the end of June to $326 million by the end of September.
33. In fact, the IMF rejected a proposal made by the Uruguayan authorities in October 2002, which only comprised the bonds with maturities in 2002–5.
34. The Second Review was also delayed waiting for the resolution of the suspended banks.

35. Recommended by the promoters of a code of conduct for sovereign debt restructuring (Couillant and Weber, 2002).
36. The poor participation rate in the Argentinian debt exchange of 2005, especially in respect to foreign investors (not encompassed by the regulations imposed to domestic bondholders, notably pension funds and banks), is an example of the irrelevance of the situation of default by the sovereign in adherence to the exchange.
37. The aggregation clause, allows two-thirds of bondholders of a specific series of bonds to modify the terms of the bond, if at least 85 per cent of holders of all affected series in the debt swap approve the change.

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8

Towards the Effective Supervision of Partially Dollarized Banking Systems

Jorge Cayazzo, Antonio Garcia Pascual, Eva Gutierrez and Socorro Heysen[1]

8.1 Introduction

The purpose of this chapter is to contribute to the design of a prudential regulatory framework for banks operating in partially dollarized economies. The discussion is anchored on the Basel Committee on Banking Supervision (BCBS) guidance on risk management, as expressed in the 1998 Capital Accord and the subsequent Basel II revision. While BCBS recommendations are in principle applicable to all banking systems, the risks that highly dollarized financial systems face are so specific and so large that they require special attention by both the financial institutions and the supervisors. The resulting exposures create substantial systemic vulnerabilities to which, from the standpoint of financial stability, supervisory regimes need to adapt.[2]

Partial dollarization increases the vulnerability of financial systems to both solvency risk and liquidity risk.[3] Solvency risk results mainly from foreign currency mismatches in the event of large movements of the exchange rate. Liquidity risk stems from the limited backing of banks' dollar liabilities, and is often associated with (or triggered by) solvency risk.

Following international standards, partially dollarized countries control banks' currency risks by imposing limits or minimum capital requirements on foreign exchange exposures. While international standards provide an adequate framework for countries with significant exposure to foreign currency, one aspect that deserves special consideration in countries with a high level of dollarization is the definition, for prudential purposes, of a riskless open foreign exchange position. We show that a matched foreign exchange position, according to the conventional definition, is not riskless in a highly dollarized country. Instead, the definition should be adapted to reflect dollarization.

Banks' attempts to contain foreign exchange risk often lead them to increase their exposure to currency-induced credit risk. They match their currency positions

by granting foreign currency loans to domestic clients whose cash flow is in domestic currency. While effectively transferring the foreign exchange risk to the borrowers, banks retain the credit risk resulting from the possibility that the borrowers' currency mismatch affects their capacity to repay the loan in the event of large adverse exchange rate fluctuations. Exposure to credit risk also increases if the value of the collateral – denominated in domestic currency – declines in relation to the value of the dollar loan obligation it is backing, following a currency depreciation.

Implicit or explicit government guarantees distort pricing decisions and enhance the attractiveness of foreign exchange-denominated contracts. Borrowers (and banks), operating in the context of fixed exchange rate or 'fear of floating'[4] regimes, expect the exchange rate risk to remain limited within the horizon set by the maturity profile of the loans. This encourages short-term lending and limits intermediation spreads in foreign currency. As a consequence, borrowers (and banks) underprice the risks associated with holding a currency mismatch in their balance sheets. In view of the higher spreads and often volatile interest rates associated with loans in domestic currency, they prefer therefore to intermediate in foreign currency. Implicit or explicit guarantees on dollar deposits or expectations of generalized government bail-outs in the event of a large depreciation further encourage foreign currency lending and borrowing.[5] The limited availability of hedging instruments in many emerging markets and the shallowness of domestic credit markets also provide a rationale for unhedged foreign currency lending. The underpricing of risk induces banks to hold insufficient reserves – in the form of provisions or capital – as a protection against the risks associated with large exchange rate fluctuations. This is a problem that bank supervisors need to address.

The limited backing of banks' foreign currency liabilities by liquid foreign currency assets and their convertibility at par create systemic liquidity risk. When the demand for local assets falls, due to a perceived increase in country risk or banking risk, depositors' attempt to convert their deposits into foreign currency cash or transfer them abroad, and/or foreign banks' attempt to recall short-term lines of credit thereby creating liquidity pressures on the banks. Unless there are sufficient liquid foreign currency assets to back liquid foreign currency liabilities, banks may run out of foreign currency liquid reserves and become unable to pay off their foreign currency liabilities coming due. Similarly, central banks may run out of international reserves to provide foreign currency lender of last resort support to distressed banks. When this happens, deposit (or loan) contracts may need to be broken and disruptive or confiscatory measures taken, thereby validating creditors' fears and justifying the run. These systemic risks are often overlooked by banks, who prefer that the cost of holding additional liquid assets be borne by central banks.[6]

The combination of risk underpricing and insufficient prudential buffers can have serious consequences in the event of large unexpected shocks, not only for individual banks but for the financial system as a whole. Given that the primary responsibility for bank solvency and liquidity must rest on its shareholders and

management, the basic prudential objective is to ensure that these risks are internalized appropriately. To this end, countries should fully implement the Basel guidelines on the management of risks, paying special attention to the specific vulnerabilities that arise in a dollarized environment. However, qualitative guidance encouraging banks to adequately manage risks, while necessary, is unlikely to be sufficient. Supervisors need to ensure that banks' buffers, in the form of capital requirements, provisioning requirements, or liquid asset requirements, are sufficient to cover shocks that may arise within acceptable risk-tolerance levels. The regulatory framework governing liquidity in a dollarized economy should also take into account that liquidity risk is twofold: (i) individual bank risk due to an isolated run on the bank's liabilities; and (ii) systemic risk linked with a generalized run on banks.

This chapter is organized as follows. Section 8.2 describes current supervisory practices, showing that several partially dollarized countries have adopted measures to reduce vulnerabilities from foreign exchange and liquidity risks, but few have addressed those arising from currency-induced credit risks. Shortcomings arise from both the lack of full implementation of the Basel guidelines on risk management and the absence of sufficient prudential buffers. Section 8.3 presents a general framework to reduce the vulnerabilities of partially dollarized economies. The framework suggests how to interpret Basel guidelines on risk management, and assess the nature and size of the required prudential buffers. Section 8.4 concludes by discussing some implementation issues. This chapter does not address issues related to the causes of (or solutions to) dollarization, that fall mainly outside the purview of prudential policies and are discussed elsewhere in this volume.[7]

8.2 Current supervisory practice

Current supervisory practices in most partially dollarized countries are not effectively addressing the vulnerabilities that are characteristic of dollarized environments. This shortcoming stems from two sources. First, many highly dollarized countries fall short of fully implementing the BCBS guidelines for the management of key risks.[8] Second, few supervisors have taken provisions to ensure that adequate prudential buffers to cover these risks are in place. While many countries have implemented measures to achieve adequate protection from foreign exchange and liquidity risks, few have sought to ensure adequate protection against currency-induced credit risk. These observations are based on the results of a survey conducted between June and September 2004 in seventeen countries in different parts of the world and with different levels of dollarization (see Appendix 8.1 for details).[9]

All the surveyed countries have implemented prudential regulations based on current international standards for controlling foreign exchange risks. Regulations include limits on (or capital requirements against) foreign exchange exposure. Many countries have switched from limits on foreign exchange open positions to

capital requirements against these positions; several have adopted both. In some cases, these regulations entail a structural open position (as in Lebanon) or asymmetric limits on open positions that allow relatively high long open positions (as in Bolivia and Peru). As is shown in the next section, in highly dollarized countries, asymmetric limits and structural open positions are generally preferable. However, to fully protect banks' solvency, regulators would gain from redefining what a riskless foreign exchange position is.

Most countries have also implemented prudential measures to reduce the vulnerabilities of financial systems to liquidity risk. Following BCBS guidelines, banks are required to manage this risk, to conduct stress tests on a variety of scenarios and to implement contingency plans to address liquidity problems. These scenarios are generally based on the estimation of maturity gaps, in many cases currency specific. A handful of countries have introduced limits on maturity mismatches. In addition, many highly dollarized countries utilize a combination of prudential measures, mostly minimum liquidity ratios and reserve requirements, to ensure that banks, and the banking system as a whole, have an adequate buffer of liquid assets to face stressful conditions. These minimum requirements tend to be relatively high, with rates ranging from 10 to 40 per cent, and may include high marginal rates for some liabilities. In many countries, liquidity requirements are higher for foreign currency liabilities than for domestic currency liabilities. In some countries (Croatia, Honduras and Slovenia), liquidity requirements only apply to foreign currency liabilities.

In contrast, the extent to which regulatory frameworks deal with currency-induced risk is limited and very recent. Two-thirds of the surveyed countries with moderate to high dollarization have not required banks to manage their currency-induced credit risk, nor conducted stress tests that allow them to identify the relevance of this risk for their banks. The remaining one-third, plus two formerly dollarized countries (Argentina and Poland), have generally focused their efforts on requiring that banks manage their currency-induced credit risk and measure it through stress testing. Few have achieved progress towards ensuring that these risks are adequately priced and covered with a sufficient buffer. Among the surveyed countries, only Uruguay has recently required higher capital for foreign currency assets[10] and only Peru requires higher provisions for foreign currency loans. Besides Peru, five other countries (Singapore, Poland, Lebanon, Argentina and Chile) report that banks are expected to assign a higher risk rating to debtors whose capacity to repay is sensitive to exchange rate movements. Interestingly enough, several highly dollarized countries have recognized that the 8 per cent minimum capital standard does not provide sufficient cover for credit risk, and have implemented higher requirements. The most notable cases are Lebanon and Romania, which require a 12 per cent minimum capital adequacy ratio.

It is not coincidental that some countries with low dollarization levels (Argentina, Brazil and Chile) have taken administrative measures to control currency-induced credit risk, whereas highly dollarized countries have avoided

them. The effectiveness of limits or prohibitions on foreign currency credit to unhedged borrowers is likely to be lower (and the costs higher) in countries that are already dollarized. Once the use of the dollar has become well established, strong prudential measures to contain the risks are more likely to induce financial disintermediation and regulatory arbitrage. Thus, it is generally easier to take preventive action when dollarization is low. While there is no easy fix to this problem of currency-induced credit risk, it is encouraging that some countries are taking the right steps anyway.

8.3 Towards good practices

The tendency to underprice risks warrants a proactive approach to prudential regulation and supervision. This approach must consider two key elements:

- *Risk-based supervision needs to be implemented along the lines of the Basel Core Principles and Guidelines for Effective Supervision, taking into account the implications of operating under highly dollarized environments*. While the responsibility for managing risk lies with the banks, supervisors can induce them to better manage their risk by setting high standards for risk management. In a dollarized environment, this implies that the supervisors should seek to ensure that banks adequately manage all their risks, including currency-induced credit risk and systemic liquidity risks. These aspects are frequently overlooked.
- *Supervisors should ensure that banks have adequate buffers to protect their solvency and liquidity, including against large shocks that could occur within acceptable risk-tolerance levels*. These large shocks would be left largely uncovered if unregulated and could have serious consequences, not only for individual banks but for the banking system as a whole and, thus, for financial stability. Determination of the size of the buffers should result from an assessment of the size of the shocks that could occur, and their impact on bank solvency and liquidity. The goal is to compensate for the underlying distortions that lead to the underpricing of risk, as close as possible to their source, and induce agents to better internalize and price the risks of operating in a dollarized environment. Minimum capital and provisioning requirements should be used to protect banks' solvency against currency-induced credit risk. Minimum liquidity requirements are recommended as a buffer against systemic liquidity risk.

While the framework presented below is consistent with international standards,[11] the discussion expands beyond the level of detail generally covered in these standards. In some instances, our view is that full implementation of current international standards, as reflected in Basel I, would not suffice to adequately address the vulnerabilities of a dollarized banking system. In some other cases, countries may

face restrictions that prevent them from addressing their vulnerabilities while at the same time adhering to international standards.

Foreign exchange risk

International standards to manage and control market risk provide an adequate framework for countries with significant exposure in foreign currency. These standards stress that bank supervisors must be satisfied that banks have in place systems that adequately measure, monitor and control market risks. In addition, supervisors should have powers to impose specific limits and/or a specific capital charge on market risk exposures, including on foreign exchange business, if warranted.

The determination of what constitutes a 'risk-free position' is necessary before deciding whether foreign exchange risks are to be priced and/or limited. Traditionally a net currency position is measured as assets minus liabilities for each currency. A position in which assets and liabilities are matched (net open position = 0) is considered to be risk-free. However, while a matched foreign open position will protect the bank's capital, expressed in domestic currency, it does not necessarily protect its capital adequacy ratio (CAR). In fact, in highly dollarized systems, exchange rate fluctuations can significantly affect the CAR of banks with a perfectly matched foreign open position. As shown in Box 8.1, the larger the difference between the dollarization ratio and the foreign exchange position as a percentage of capital, the higher the impact on the CAR. For example, a 20 per cent depreciation would reduce the CAR of a bank with a 67 per cent dollarization ratio and a matched open position (as conventionally defined) from 10 per cent to 8.8 per cent. Instead, should the bank maintain a foreign open position equivalent to its rate of dollarization, it would maintain its CAR at the 10 per cent initial level.

This problem is mitigated, but not fully resolved, by the structural position allowed by the Basel Committee.[12] Banks may be allowed to protect their CAR by excluding from their net open position any position they have deliberately taken to hedge, partially or totally, against exchange rate fluctuations. However, three conditions have to be met: (i) the positions have to be of a non-dealing nature; (ii) the position does no more than protect the bank's CAR; and (iii) any exclusion needs to be applied consistently during the life of the asset.

It would be desirable to have a more direct approach aimed at protecting banks' CAR. Supervisors should centre the calculation of capital charges (and/or limits) on the basis of the *actual level of dollarization of each bank*. Under this approach, banks *are required* to fully hedge their CAR against exchange rate movements, i.e., *the structural position is not a choice*. For this approach to be effective, gains in the open position should be tax exempt. Thus, should a bank have 30 per cent of its assets in foreign currency, and supervisors establish a limit of 20 per cent of risk-tolerance, the corresponding limit for this bank would be a band of 20 per cent both below and above its current dollarization level, resulting in an open position not below 10 per cent of capital, nor above 50 per cent of capital (see Box 8.1).

Box 8.1 How does a devaluation affect the CAR of a bank, depending on its foreign exchange position and asset dollarization?

The example below is a simple way to illustrate how the capital adequacy ratio of a bank is affected by a depreciation/appreciation of the domestic currency, if its foreign exchange open position, as a proportion of capital, differs from the level of dollarization of its assets. Assume the following initial situation:

Bank A (matched foreign open position; 67 per cent dollarization of assets)
FX assets = 200 FX liabilities = 200
LC assets = 100 LC liabilities = 70
Capital = 30
FX open position = 0 (200–200)
CAR = 10% (for simplicity, assume that all assets weight 100 per cent for capital adequacy purposes)

Bank B (mismatched, set at the level of dollarization of assets; 67 per cent dollarization of assets)
FX assets = 200 FX liabilities = 180
LC assets = 100 LC liabilities = 90
Capital = 30
FX open position = 20, equivalent to 67 per cent of capital
CAR = 10%

What would happen after a 20 per cent depreciation of the domestic currency?

Bank A (matched)
FX assets = 240 FX liabilities = 240
LC assets = 100 LC liabilities = 70
Capital = 30
CAR = 8.8%

Bank B (mismatched)
FX assets = 240 FX liabilities = 216
LC assets = 100 LC liabilities = 90
Capital = 34
CAR = 10%

As shown above, high dollarization makes it necessary to carefully assess the convenience of having regulatory requirements in which limits or capital charges are based upon the belief that a matched net position is risk free.

Credit risk

As explained above, unexpected exchange rate movements generate currency-induced credit risk that, in a partially dollarized banking system, tends to be highly underpriced. Most of the time, banks' and borrowers' expectations are validated by the behaviour of the central bank, which generally resists depreciations due to concerns about the financial stress these would cause.[13] Thus, many inadequately hedged foreign currency loans are granted and banks tend to hold insufficient reserves to protect themselves from large depreciations. To address this problem, risk needs to be internalized and adequate prudential buffers introduced, in the form of capital or provisioning requirements. Generally, capital covers unexpected losses, while provisions cover expected losses, either identified (covered by specific provisions) or latent losses not yet identified (covered by general provisions). Alternative options are also discussed.

Supervision of credit risk

International standards provide a sound basis to ensure that financial institutions, including those in dollarized economies, manage their credit risk properly. BCBS 'Principles for the Management of Credit Risk' (1999) state that banks should operate under sound, well-defined lending criteria, which include a thorough understanding of the borrower, as well as the purpose and structure of the credit and its source of repayment (Principle 4). Banks should also have information systems and analytical techniques that allow them to measure the credit risk inherent in all activities (Principle 11). Additionally, banks should consider the potential impact of future changes in economic conditions so as to assess individual credits and credit portfolios under both normal and stressful conditions (Principle 13). Moreover, the contingent nature of *market-sensitive exposures*, such as foreign exchange contracts, requires that banks have the ability to assess the probability distribution of the size of actual exposure in the future, and its impact on both the borrower's and the bank's leverage and liquidity.

In countries with significant lending in foreign currencies, these principles imply that banks should pay particular attention to currency-induced credit risk. Issuing a specific regulation or guidelines on such a risk could be of great assistance to banks. The regulation should establish disclosure requirements and minimum standards, and define the responsibilities of directors and managers as regards risk management. Building up the supervisory capacity to assess the adequacy of banks' credit risk management and exercising supervisory powers to ensure compliance are essential.

Supervisors should ensure that banks gather sufficient information to measure the sensitivity of a borrower's capacity to repay under changing exchange rates. For all relevant exposures, banks should be required to gather information on borrowers' cash flows and balance sheets, with a breakdown by currency. Even when a bank lends only in domestic currency, its borrowers' capacity to repay could be hampered, in the event of a depreciation, if the borrower has significant liabilities in foreign currency with other counterparts. Credit bureaus could also be encouraged to provide currency-specific information on all debts, highlighting – if relevant – debts indexed to the domestic price index or the exchange rate.

Separating by currency assets and liabilities, as well as revenues and expenditures, is not a trivial exercise; banks need to have a deep knowledge of their customers and the markets where they operate. For instance, an importer who prices his products in dollars may see his capacity to repay hindered by a depreciation if this causes a contraction in the demand for his products. An exporter who sells in the domestic market could also be negatively affected by a depreciation. Inversely, a worker who earns domestic currency, but receives remittances from abroad, could maintain his capacity to repay in the event of a depreciation, particularly if the remittances come through the bank and are defined as the source of repayment.

While the exchange rate is expected to be the main source of indirect credit risk in dollarized financial systems, the significance of changes in interest rates should not be overlooked. Borrowers with domestic currency loans and floating interest rates, or with a maturity mismatch, could be an added source of credit risk, especially

under fixed exchange rate regimes or *fear of floating*. In such cases, domestic currency interest rates tend to be volatile, affecting the borrower's capacity to repay and the bank's exposure to credit risk.

Supervisors should make sure that banks' policies and procedures consider their exposure to currency-induced credit risk. Banks should define internal policies that could include limits on these exposures and, in countries where these exposures are already high, target a progressive reduction in their exposure. Risk can be limited by reducing banks' exposure to mismatched borrowers or by encouraging borrowers to reduce their currency mismatches. Offering hedging products or charging interest rates that better reflect currency-induced credit risk could be useful in this regard. Banks should also assess their loan-pricing policies to ensure that they adequately reflect overall credit risk. Special attention could be given to setting policies regarding foreign currency loans to individuals (for consumer goods or housing).

The assessment of borrowers' capacity to repay their loans in the event of changes in exchange rates or interest rates can be done individually for the large borrowers, using information on currency-specific cash flows and balance sheets. For smaller borrowers with homogeneous characteristics, such as individuals or small firms, the assessment can be done on a group basis. When the information on currency-specific cash flows and balance sheets is not available, it would be prudent to assume that all the income of these borrowers is denominated in domestic currency.

The selection of appropriate scenarios and assumptions for stress testing is essential in order to properly assess the credit risk embedded in the bank's portfolio. Supervisors could let banks define the parameters for these changes (exchange rate, interest rate, output) and assess their adequacy at the time of the supervisory review. Alternatively, supervisors may provide the parameters, thereby making the results of the stress tests more comparable and easier to review. To minimize any possible confusion in the interpretation of these parameters, the supervisory authorities should clearly explain the rationale and methodology on which they are based.

Banks should be able to calculate the expected losses from their loan portfolio, including those that arise from borrowers' currency, interest rate or maturity mismatches. These will depend on the borrowers' *probability of default*, on the bank's *exposure at the time of default* and on the bank's *loss-given default*. While it may not be realistic to expect that all banks in all countries will have the capability to estimate default probabilities, assessing the capacity to repay should provide a basis for estimating expected losses. In turn, to estimate *loss-given default*, banks should be able to assess the *recovery value of collateral*, which depends on the market value of collateral and on the costs of recovery (taking into account the time it takes to foreclose and fully recover the collateral).

As the recovery value of collateral can also be affected by market conditions, banks should assess this value for changing market conditions. The limited availability of information on most asset prices is a difficulty that would need to be overcome in most countries. When collateral is difficult to recover, highly illiquid, or its price

cannot be estimated, it may be advisable to disregard such collateral. In other cases, frequent appraisals of relevant collateral are an option, albeit costly, to obtain this information. Alternatively, previously appraised collateral values could be adjusted frequently, using simplified methods to be reviewed by supervisors. For instance, the foreign currency value of real estate collateral could be expected to decline in the event of a depreciation. In the absence of better information, banks could assume that real estate prices are set in domestic currency, and thus their fall would be proportional to the depreciation. This method would probably provide a worst-case scenario.

Banks should disclose their policies on credit-risk management, and their main exposures, including as regards currency-induced credit risk. Such a disclosure should be required at least annually, as part of the bank's audited financial statements. The availability of this information should help foster market discipline, as the most sophisticated creditors would penalize banks that take higher risks, increasing their costs of funding, and thus encouraging more prudent behaviour. However, to prevent disclosure from causing a loss of confidence, disclosure requirements could be phased in so as to give time for improvements in risk management to be implemented.

Supervisors should conduct their own independent assessments of banks' exposure to credit risk, including currency-induced credit risk. These assessments should be conducted for individual banks and the overall banking system. Stress-testing techniques could be used to estimate banks' exposure to credit risk under changing market conditions. These stress tests could be conducted with information regularly provided by banks and available in the supervisory data bases. Supervisors should have access to detailed information on borrowers, such as the one provided by credit bureaus. Alternatively, supervisors should have the option to define specific stress-testing scenarios, and require banks to run them. These off-site assessments should be complemented with an on-site evaluation of banks' main exposures to credit risk. Box 8.2 presents an example of simple stress tests that could be applied by supervisors. A more detailed presentation is included in Appendix 8.2. Although direct limits or prohibitions on foreign currency loans to inadequately hedged borrowers may have been successful for some countries, such as Brazil or Chile, their application to highly dollarized financial systems may not be advisable. Indeed, such measures tend to be used by countries where high dollarization has not yet become a problem. Administrative measures generally introduce distortions, have high costs and promote regulatory arbitrage. Hence, their applicability in countries that are already highly dollarized is likely to be limited. Instead, it is preferable to let banks manage their risks.

Expected losses

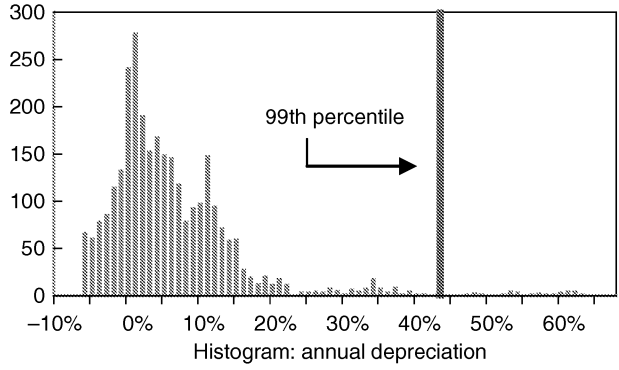
Banks' loan classification systems should reflect the borrowers' capacity to repay under various market conditions. Loan classification rules in some partially dollarized countries are still based on past payments performance. These need to be phased out and replaced by more forward-looking rules. In particular, a borrower should be downgraded, even if he has always been current on all payments, if

Box 8.2 Quantitative assessment of currency-induced credit risk and its application to off-site supervision: the case of Peru

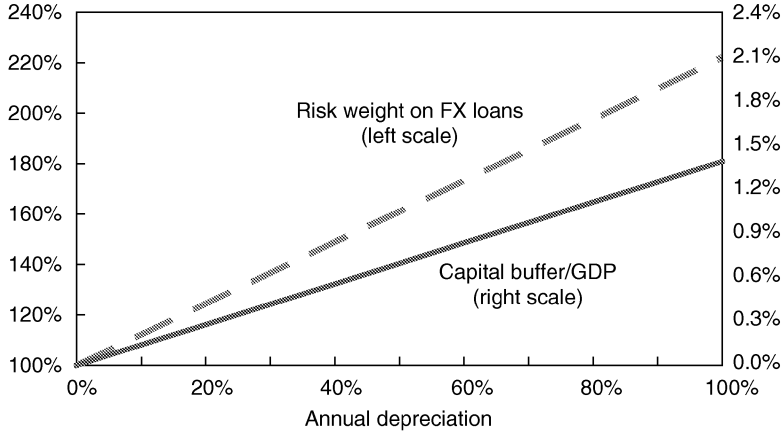
The impact of exchange rate shocks on the FX loan portfolio *(see Appendix 8.2 for details). In the case of Peru, the econometric estimation of the relationship between provisions and depreciation shows that a 1 per cent depreciation results in a 1.9 per cent increase in the growth of provisions on FX loans:*

*Growth(FX_loan_provisions/FX_loans) = 1.9*Depreciation + f[GDP growth; Lending Rate; Inflation].*

The probability distribution of exchange rate shocks and the desired level of protection against currency-induced credit risk. With these econometric estimates, a bank supervisor can assess the minimum capital buffer for a bank to withstand, for example, a 99th percentile exchange rate shock. The historical distribution of exchange rate shocks in Peru since mid-1992 shows that the 99th percentile corresponds to a depreciation of 43 per cent. Clearly, the larger the shock the supervisor would like to protect against, the more costly in terms of bank capital. Consequently, the supervisor may consider capital buffers against more moderate shocks, such as a 20 per cent depreciation (90th percentile shock).



The capital buffer will depend on the size of the exposures, including the FX loan portfolio, and can be set in terms of additional provisions on FX loans or additional capital charges. *The figure below shows (i) the capital buffer against an annual depreciation of 'x' per cent and, as alternative measure, (ii) the risk weight on FX loans that would ensure compliance with the minimum regulatory CAR of 9.2 per cent. The buffer has been calibrated to the level of RWA and FX loans of Peru's banking system.*[14]



his projected cash flow is not adequate to fully service all his debts under expected market conditions. The degree of downgrading should also be related to the extent of the impairment of the borrower's repayment capacity under likely stress-test scenarios. Note that this approach does not imply that foreign currency borrowers who do not have a foreign currency income should be automatically downgraded.

Loan loss provisions should reflect the impairment of borrowers' capacity in the event of expected changes in market conditions. A combination of specific and general provisions could be applied for this purpose. Specific provisions could be applied when expected losses are estimated for individual borrowers, and general provisions when the estimation of expected losses results from aggregate tests.

The application of such loan classification and provisioning rules may require banks and supervisors to have analytical capabilities that may not currently be in place. As developing these capabilities takes time, two simplified options could be explored in the meantime:

- *A prescriptive approach would establish automatic downgrades (and higher provisions) for types of borrowers whose capacity to repay is perceived to be highly sensitive to expected changes in the exchange rate*. These rules would have to be designed for each particular country, taking into account specific market conditions and institutions. In some countries, it might be individuals that are most at risk, in others, it might be corporates in the non-tradable sector. While simple to implement, this approach has a number of drawbacks, as it creates arbitrary divisions between types of borrowers and could promote regulatory arbitrage. If badly designed, it may not be of much value in internalizing risks.
- *Alternatively, banks could develop their own systems and capabilities to determine provisions*. Those banks that, in the view of the supervisor, do not have appropriate systems in place, should be required to create an additional general provision on their overall foreign currency portfolio. Provided that this provision is high enough (it would need to be higher than – or similar to – estimated specific provisions under an expected loss provisioning system), this approach has the advantages of creating the right incentive for banks to develop their own risk management capacity.

Unexpected losses

Banks should hold enough capital to cover the credit risk caused by unexpected changes in the exchange rate. Authorities must set the size of this buffer and define how to achieve it. The buffer should provide sufficient cover for an exchange rate shock within acceptable risk-tolerance levels. It should apply only to assets that constitute a currency-induced credit risk (for un-hedged borrowers). While capital (rather than provisions) would normally be required to cover unexpected losses, for reasons to be discussed below, some authorities may choose provisions. For simplicity, the decisions about the size of the buffer and its nature are presented independently.

The size of the buffer

The size of the buffer would depend on: (i) the impact of the exchange rate shocks on the value of banks' portfolios; (ii) the probability distribution of exchange rate shocks; and (iii) the degree of protection with which authorities are comfortable. Since the shocks and their impact on the value of portfolios are subject to a large degree of uncertainty, the decision will be affected by the availability of information and by assumptions made. In turn, the degree of protection sought by policymakers should take into account that higher protection increases the cost of conducting banking business. The three following issues therefore need to be addressed:

- *Impact of exchange rate shocks on the value of banks' portfolios*. The quantitative assessment of currency-induced credit risk typically involves: (i) econometric estimates of the relationship between exchange rate movements and a measure of credit risk, using either aggregate bank data or the financial information of the borrowers; or (ii) forward-looking assessment of the impact of a devaluation on the repayment capacity of the borrower measured by its interest coverage ratio or other financial indicators. The first methodology relies on past information; hence, it may not provide a good indicator of the effect of a future depreciation in the event of changes in regulation or changes in the underlying quality of borrowers. The second methodology requires information on the currency composition of the borrowers' balance sheet and income statement that might not always be available. Both methods depend on the quality of information available and the adequacy of the period of time covered by such information. For instance, currency-induced credit risk could be underestimated if the data available corresponds to a period of economic prosperity (i.e., the upturn of an economic cycle). An example of an assessment of this risk, under the first method, is presented in Box 8.2, where it is used to examine the size of the buffer needed to cover currency-induced credit risk of various depreciation levels (details are presented in Appendix 8.2).
- *Probability distribution of exchange rate shocks*.[15] To estimate the probability distribution of exchange rate movements, authorities may refer to past information on exchange rates in the local economy. This approach has the drawback that past information regarding exchange rate changes may not be a good predictor of future changes, particularly for countries with fixed or managed exchange rates, where imbalances have only recently arisen.[16] An alternative could be to use historical information from similar countries that have experienced exchange rate shocks or simulations. A macroeconomic model that captures the accumulating imbalances or the distribution of exchange rate changes in countries with similar characteristics could be used. The methodology should be carefully explained to prevent simulations of exchange rate shocks being regarded as a signal of a change in the exchange rate regime or a decision to pursue policies inconsistent with maintaining this regime.[17]
- *The desired level of protection*. Authorities must set a *risk-tolerance level* for currency-induced credit risk. Should they be protected from 99 per cent of possible levels of depreciation or only from 95 per cent? The larger the depreciation, the larger the buffer and, thus, the higher the cost of banking. Hence, the benefits from

additional protection should be carefully weighed against its costs. The latter (*Ci*) that result from protecting against an '*i*' per cent devaluation can be measured as the product of the size of the buffer (*Bi*) times the opportunity cost of capital (*r*) in per cent of output (*GDP*) or bank profits (*P*):[18]

$$Ci=r*Bi/GDP \quad \text{or} \quad Ci=r*Bi/P.$$

Capital or provisions?

The decision on the nature of the buffer is not an easy one. The use of provisions to cover losses against unexpected exchange rate movements departs from International Financial Reporting Standards (IFRS), shortly to be adopted by many developed and emerging countries. In fact, under International Accounting Standard (IAS) 39, assets should only be subject to specific provisions when they are impaired, i.e., when there is a known event causing the impairment of the loan. Strictly speaking, a future unexpected depreciation does not qualify as a 'known event'. General provisions, on the other hand, can only be required for losses that can be estimated in a pool, but have not yet been individualized. Thus, under IAS 39, potential losses from an unexpected depreciation would fail to qualify under either of these definitions and would need to be covered by capital requirements.

However, raising capital requirement may be difficult when such an increment would require a change in legislation. Moreover, an increase in capital, when mandated through an increase in the CAR, is rather inflexible and does not allow for much fine-tuning across risk categories. Instead, a preferable approach is to use higher risk weights for assets that are more sensitive to currency-induced credit risk.

When risk weights are not under the full control of the supervisors or cannot be adjusted across risk categories in a sufficiently flexible manner, the alternative is to use provisioning requirements. Under this option there is no need to distinguish between expected and unexpected exchange rate movements. Specific provisions could be required when the sensitivity analysis is conducted individually, and general provisions could be required when borrowers are assessed as a group.

Liquidity risk

Liquidity risk can be: (i) idiosyncratic, affecting individual banks and generally related to their own behaviour; or (ii) systemic, in case of widespread liquidity problems, generally stemming from macroeconomic fundamentals, contagion or generalized panic. While both types of risk are present in all financial systems, dollarized financial systems tend to be more vulnerable to systemic liquidity risk. The supervisory framework of a highly dollarized banking system should thus include: (i) a risk-based supervision of liquidity risk and its management, based on BCBS guidelines; and (ii) a minimum liquidity or reserve requirement to ensure that banks adequately internalize the liquidity risk that is specific to a dollarized environment.[19] As in the case of capital requirements, the goal should be to better internalize risk. Limits on maturity gaps, while effective for the management of idiosyncratic risks, may not be as effective for managing systemic liquidity risk.

Supervision and management of liquidity risk

The international standards on liquidity management, presented in 'Sound Practices for Managing Liquidity in Banking Organizations', produced by the BCBS (2000), are a key reference for bank supervisors, and are applicable to highly dollarized financial systems. These practices state that banks should have a strategy for the management of liquidity (Principle 1), with policies approved by the Board (Principle 2). Banks should also: (i) establish a process for the ongoing measurement and monitoring of net funding requirements; (ii) analyze liquidity under a variety of 'what-if' scenarios; (iii) review their assumptions frequently to ensure they continue to be valid; and (iv) have contingency plans to handle liquidity crises (Principles 5, 6, 7 and 9). Currency-specific issues, a key concern in dollarized financial systems, are explicitly addressed. Banks are expected to have a system to measure, monitor and control their liquidity position in the major currencies in which they are active, and undertake a separate analysis of their strategy for each currency (Principle 10). Based on this analysis, banks are expected to set and review internal limits on the size of their cash flow mismatches over particular time horizons for foreign currencies in aggregate and for each significant individual currency in which they operate (Principle 11).

Following these guidelines, banks in dollarized economies should identify funding needs in the main currencies in which they conduct operations. This entails measuring all cash inflows against all cash outflows in each main currency, from all possible sources, including off-balance-sheet items. Immediate funding requirements, as well as future needs, should be determined. A variety of methods can be used for this purpose, but banks should consider not only contractual maturity but observed behaviour. Careful profiling of behaviour is essential for banks to adequately assess funding requirements under changing market conditions and make sound liquidity decisions. This approach should be also used to monitor compliance with internal limits as well as regulatory limits or cash requirements.

Liquidity analysis should consider a variety of stress tests of individual as well as system-wide disturbances, including the two main specific sources of liquidity risks for dollarized financial systems. First, scenarios should assess the impact on liquidity of changes in market conditions, such as a currency depreciation or rising interest rates, taking into account a bank's exposure to *currency-induced* and *interest rate-induced credit risk*. These indirect credit risks will affect a bank's liquidity, as assets may not be repaid under their original terms and may also be difficult and costly to sell under stressful conditions. Moreover, the resulting solvency risk increases the probability of a deposit run against all the banks that are perceived to share this problem, and may lead to systemic liquidity problems. Second, scenarios should model the impact on liquidity of *currency-specific asset and liability volatility* experienced in the past or that are likely to occur, including possible capital flight. The evolution of a bank's currency-specific and overall liquidity profile – as measured by a maturity ladder or by ratios of liquid assets – under a variety of scenarios can be a useful benchmark for assessing the bank's liquidity

and for determining the action to be taken to improve the bank's performance under those conditions.

Banks' contingency plans should: (i) address their strategy for handling individual as well as system-wide liquidity crises; and (ii) establish procedures for making up cash flow shortfalls under emergency situations, including currency-specific shortfalls and cash shortfalls in foreign currency (bills). These plans should consider market and institutional restrictions that may exist under crisis situations. While foreign exchange shortages for a particular bank might be solved by accessing the foreign exchange market, such a recourse may no longer be available under crisis situations. Moreover, the problem of shortfalls in foreign currency bills is costly to overcome at short notice and under stress. While some central banks in dollarized countries store significant volumes of foreign currency bills, others may not be willing to assume the associated storing and shipping costs. Banks should thus have clear procedures to solve shortages of foreign currency bills at short notice. As small depositors are more likely to withdraw their deposits in cash, banks with a broad deposit base are likely to require proportionally more dollar bills. Under systemic crisis scenarios, the strategies should also consider possible limitations of access to key sources of funding (e.g., debt issues in domestic or foreign markets, domestic or foreign interbank funds) and recognize that market disturbances could hamper the liquidity of markets normally regarded as liquid (e.g., domestic corporate equity or bonds, government paper).

Supervisors should thus assess the adequacy of banks' liquidity risk strategies, policies and procedures to withstand the disturbances that are likely to occur in the financial system in which they operate. In this regard, the supervisory review should examine whether banks' plans, policies and actions take into account the specific sources of liquidity risk of operating in a dollarized financial system, such as currency-induced credit risk, the absence of a lender of last resort, and the added potential of systemic liquidity crunches. Banks' contingency plans should take into account shortfalls of *foreign currency liquid assets and foreign currency cash*. The supervisory assessment of banks' exposure to liquidity risk should also take into account liquidity risk derived from *currency-induced credit risk*. Based on this assessment, supervisors should require corrective measures as necessary, including changes to liquidity risk management policies and practices, additional holdings of liquid assets or lower maturity mismatches and a reduction in exposure to liquidity risks stemming from *currency-induced credit risk*.

A buffer for liquidity risk

Minimum liquidity or reserve requirements are preferred to more market-based measures, such as limits on maturity gaps. While the latter are more risk-sensitive and allow banks more freedom on how to manage their liquidity, hence are less costly, they are unlikely to provide an adequate buffer to protect banks and the financial system from systemic liquidity risk in dollarized systems. Under a systemic liquidity crisis, assets that are normally liquid may become illiquid, and liabilities that are normally stable may become unstable. This is particularly true if early withdrawal of time deposits and other liabilities is possible.

Required foreign currency liquid assets should be held in foreign currency and their rates may be set higher than domestic currency requirements. The specific design of the minimum requirements has to be tailored to the needs of each particular country. However, the following general considerations should be noted:

- *Eligible assets* should be liquid even under stressful market conditions. In some countries this restricts the range of eligible assets to cash, deposits at the central bank and liquid deposits in investment-grade financial institutions abroad. In others, the range of liquid assets could be somewhat wider. If pressures are likely to mount to use central bank international reserves for other purposes (e.g., fiscal), it may be advisable to have liquidity requirements, instead of reserve requirements. In turn, if there are difficulties ensuring that bank liquid assets are in fact liquid (e.g., they may be pledged as collateral for bank operations), reserve requirements may be preferable. An alternative option is to set up a trust fund abroad, with the sole purpose of being used as collateral for central bank liquidity support to the contributing banks.
- The *liability base* should include the broadest range of liabilities likely to be volatile under stressful market conditions. This reduces the scope for arbitraging the regulation through liabilities that are excluded from the minimum requirements.
- When setting the minimum rates, authorities should assess the costs of these requirements against the benefits of the insurance they provide. An example of a simplified way in which the costs and benefits of these requirements can be assessed is presented in Box 8.3.
- Liquidity requirements should not unduly tax banks' operations or create a captive demand for government debt. If liquid assets are required to be held in the form of central bank liabilities, these should pay market interest rates.

Box 8.3 Costs and benefits of prudential requirements to control liquidity risk: the case of Peru

This box estimates the costs and benefits of two overlapping prudential requirements used in Peru to control liquidity risks: reserve requirements and liquidity requirements.

Prudential norms

Reserve requirements: Required reserves are held as vault cash or deposits at the Central Bank in the deposit's currency denomination. In addition to a 6 per cent non-remunerated reserve requirement applied to all deposits, foreign currency deposits are subject to 30 per cent marginal reserve requirement (down from 45 per cent in 1998, but up from 20 per cent in early 2004). This regulation was recently modified to subject more credits from banks abroad to reserve requirements. Thus, average required reserves on FCD are currently 29.5 per cent. The Central Bank pays a fixed rate of 2.25 per cent on foreign currency reserves above the 6 per cent level.

Liquidity requirements: Banks are required to hold liquid assets equivalent to at least 8 per cent and 20 per cent of all their liabilities maturing during the next twelve months,

Continued

Box 8.3 Continued

in domestic currency and foreign currency respectively. Eligible assets include vault cash, deposits at the Central Bank, Central Bank certificates of deposit, deposits in first-rate foreign banks and investments in securities negotiated in centralized markets and rated as investment grade by international agencies.

Costs

Both liquidity and reserve requirements affect banks' profits, as liquid prime assets normally earn lower returns than less liquid assets, and reserve requirements are remunerated as below market rates. Assuming that, in the absence of liquidity or reserve requirements, banks would only hold liquid assets equivalent to 5.5 per cent of local currency liabilities and 3.6 per cent of foreign currency liabilities, costs would amount to 1.6 per cent of liabilities in foreign currency (1.5 per cent for reserve requirements and 0.7 per cent for liquidity requirements) and 0.45 per cent of liabilities in domestic currency (0.2 per cent for reserve requirements and 0.4 per cent for liquidity requirements).

Benefits

The marginal contribution of the liquidity and reserve requirements to limiting liquidity risk can be estimated by subtracting the liquid assets that banks would hold voluntarily from the required liquid assets, which amounts to 15 per cent of total bank liabilities. This figure is substantially above the maximum run experienced by the Peruvian banking system from 1993 to June 2002 (maximum losses for the banking system range from 2 per cent to 8.3 per cent). However, since runs have been generally accompanied by some flight to quality, this buffer would not protect against – and perhaps should not be expected to protect against – the largest run at the individual bank level.

8.4 Implementation issues

The implementation of the proposed supervisory framework raises a number of challenges for bank supervisors. How, when and to what extent the above-mentioned adaptations should be implemented are not easy decisions. The specific characteristics of the financial system and the economy in which it operates and the market infrastructure and institutions, have to be taken into account. The following questions are at the centre of the decision process:

- Who really needs this framework?
- How much risk reduction is desirable?
- What is the best sequence of implementation?
- How can regulatory arbitrage be avoided?
- Is the implementation of this framework independent of the actions of other national authorities? Or should it be regarded as part of a broader national plan to reduce the vulnerabilities from dollarization and, therefore, be coordinated with other authorities, such as the fiscal or monetary authorities?
- How can these measures be integrated into the broader plans of supervisory and regulatory improvements?

There is no unique dollarization threshold beyond which countries should implement the proposed measures. It is important to note that these recommendations are not to be regarded as an all-or-nothing package; some countries may need all of them, others may need some of them; yet others may need none. Clearly, countries with dollarization levels above 50 per cent, or with somewhat lower but increasing levels of dollarization, should seriously consider the risks discussed in this chapter. On the other hand, countries with dollarization levels below 15 per cent may not need to invest resources in adapting their supervisory frameworks. In many countries, however, it may not be easy to decide if it is worth investing time and resources to insure against risks that may or may not materialize. The recommendation for countries in the grey area is to first gather information that will allow an assessment of their exposure to these risks. Stress tests, such as the ones presented in Appendix 8.2, can assist in determining how sensitive the solvency and liquidity of their financial systems are to an exchange rate depreciation and other market disruptions associated with dollarization. In some countries, high exposure to dollarization risks could be concentrated in one business segment, such as mortgage or consumer loans, so it would be best to address these risks separately.

The costs of controlling the risks of dollarization could be high for highly dollarized financial systems. In fact, the costs of implementing the proposed measures would be high if the risks that need to be addressed are also high. The measurement of the additional risks from dollarization, and the estimated risk reduction achieved by a specific prudential measure and its costs, are key for the design of prudential requirements. How much protection against the risks of dollarization is desirable has to be gauged against the costs of this protection. Calculations such as the ones presented in Boxes 8.2 and 8.3 could be of assistance for this purpose. The objective of these prudential requirements cannot be to eliminate all risks, as the enormous costs would create huge incentives for arbitrage. In some cases, a carefully phased implementation would be necessary to achieve the desired risk reduction without making the business non-profitable. A road map for implementation needs to be tailored to the specific needs, the level of bank supervision and the condition of the banking system of each particular country.

While the optimal sequence of implementation cannot be defined independently of the country's institutions, supervisory framework and the condition of its financial system, supervisors should recognize that:

- *Currency-induced credit risk* is a specific type of credit risk. Supervisory measures that attempt to address this risk without having addressed the more general weaknesses of overall credit risk management are not likely to prevent the next financial crisis. More precisely, if banks do not have adequate overall credit risk management, they are unlikely to have good *currency-induced credit risk* management.
- Better disclosure of risk exposures and management policies can promote market discipline; however, when applied to vulnerable financial systems and weak risk management, it could also create confidence problems. The timing of

disclosure requirements has to be carefully considered to prevent this from happening.

Tightening prudential regulation may create incentives for regulatory arbitrage. Banks could be induced to transfer risks to, or register transactions in, other entities – domestic or foreign – that are not subject to the new prudential requirements. In designing these measures, authorities should thus try to reduce the scope for regulatory arbitrage. This is particularly important when designing provisioning or capital requirements, minimum liquidity requirements and limits or prohibitions on certain mismatches or transactions. Regulatory reforms may therefore need to be accompanied by measures geared at avoiding circumvention of such regulations. For instance, supervisors should be aware that tightening norms on currency-induced credit risk may lead banks to increase intermediation in local currency with much shorter maturities, or trade one risk for another (i.e., when long-term projects are financed with short-term domestic currency loans, the currency-induced credit risk is traded for a direct credit risk).

The possibility of increasing risk in the domestic currency loan portfolio should not be overlooked. Also, whenever possible, the regulations should be applied to all members of a conglomerate. For this purpose, effective consolidated supervision is necessary. It is noted, however, that in some of the countries surveyed, consolidated supervision of conglomerates is incomplete and ineffective. Moreover, authorities may lack the power to impose prudential requirements beyond the domestic borders, particularly if the cross-border members of the conglomerate are not branches of the domestic bank. Additionally, regulatory arbitrage is not a static problem. In fact, the effectiveness of some measures may erode over time as banks find ways to circumvent their costs and, thus, supervisors should often review them to ensure their continued effectiveness.

The recommendations discussed in this chapter can be easily integrated into the current improvement plans of most supervisory agencies. The proposed adaptations are based on the Basel I framework, but are also consistent with a transition towards Basel II. In fact, being in full compliance with Basel 'Core Principles for Effective Banking Supervision' (1997) and implementing other elements of the Basel I or Basel II supervisory framework should help to improve the effectiveness of the proposed measures.

Since prudential supervision can only mitigate some of the risks arising from dollarization, prudential measures may need to be part of a broader medium-term plan designed to promote the use of the domestic currency. The plan would include measures such as: keeping inflation low, removing administrative ceilings on interest rates, reducing high unremunerated reserve requirements for local currency deposits, developing markets for local currency-denominated public securities and improving the efficiency of the payments system.[20] While most of the prudential measures to strengthen the supervisory framework could be implemented independently of other national authorities, coordination between the monetary and prudential authorities is advisable to improve the effectiveness of their plans.

Appendix 8.1 Country practices: survey results

This section explores current supervisory practices to control the risks stemming from banks' foreign currency activities. It is based on a survey conducted between June and September 2004, in seventeen countries at diverse levels of economic development and in diverse regions across the world.[21] The level of financial dollarization[22] of the countries surveyed is also diverse, including six countries with more than half of their total deposits in foreign currency (Bolivia, Croatia, Lebanon, Peru, Singapore and Uruguay), six countries with dollarization levels between 30 and 50 per cent (Costa Rica, Honduras, Latvia, Romania, Slovenia and Turkey) and five countries with low levels of dollarization (Argentina, Brazil, Chile, Poland and Sweden).

Foreign exchange risk

Traditionally, prudential regulation on foreign exchange exposures has been based on limiting banks' foreign currency exposures. More recently, however, an increasing number of countries are imposing capital requirements against open foreign exchange positions. Requiring capital for foreign exchange exposures, in addition to that required for credit risk, makes it more difficult for weakly capitalized banks to take on new risks. However, capital requirements give a bank greater flexibility in choosing the risks it will accept by allowing managers to allocate a bank's capital between credit and market risk, including foreign exchange risk.[23]

Most countries surveyed have both capital charges and limits on foreign exchange exposures (Table 8A1.1). Three countries (Poland, Singapore and Sweden) have only capital charges on foreign exchange exposures, while six countries have only limits on these exposures (Argentina, Bolivia, Chile, Costa Rica, Honduras and Uruguay). The remaining eight countries have both. Capital charges on foreign exchange risk vary between 8 per cent (minimum Basel recommendation) and 12 per cent (in the case of Lebanon). A special case is Brazil, where the capital requirement is 50 per cent of foreign exposures exceeding 5 per cent of capital. Some countries (Bolivia and Peru) have asymmetric limits on foreign exchange exposures, whereas others permit structural positions (Lebanon).

Over half of the countries surveyed have specific risk management guidelines pertaining to foreign exchange risk. In Peru, guidelines are quite specific regarding the methodology for their internal control systems, including value at risk, scenario analysis, back testing and stress testing. In other cases, there are general guidelines on risk management; however, there are no specific guidelines on foreign exchange risk.

Credit risk

Data collected by supervisory authorities

Some dollarized countries report collecting debtor information that distinguishes domestic and foreign currency claims (Bolivia, Lebanon, Peru and Uruguay). Detailed information on the loan portfolio, by debtor or by operation, is generally collected for large exposures. Argentina, Brazil, Chile, Croatia and Poland, for example, collect individual information for commercial or medium to large debtors, and gather aggregated information at the portfolio level, for consumer loans or small companies. Others (Bolivia, Costa Rica, Honduras, Peru, Turkey and Uruguay) gather individual information, also for small exposures.

Four countries (Poland, Costa Rica, Honduras and Uruguay), two of them with low dollarization levels, report having a working definition of the un-hedged borrower.[24] However, these are internal definitions of the supervisory agency, not published or shared with financial institutions. Only Costa Rica requires banks to report their exposure to credit risk from un-hedged borrowers. Costa Rica reports gathering quarterly information on the capacity of large borrowers to generate a foreign currency cash flow and estimating, as a residual, large borrowers that do not have foreign currency revenues. As of March 2004, 28 per cent of all

Table 8A1.1 Foreign exchange risk practices for selected countries

	Prudential rules						Supervisory guidelines		Supervisory assessment and preventive action		FX exposure data collection
Country	FX risk capital charge requirement[1] In per cent	Type[2] I or C	Limits on FX exposure[3] Y/N	Long open position limit[4] In per cent	Short open position limit[4] In per cent	Type[5] I or C	Specific FX risk management guidelines[6]	Disclosure requirements	Most common FX position[7]	Spot and forward markets reasonably active[8]	Frequency[9]
Argentina	N	n.a.	Y	30	−30	I	N	Y	L	A / N	D
Bolivia	N	n.a.	Y	80	−20	I	Y	N	L	A / N	D
Brazil	50	C	Y	30	−30	C	Y	N	L	A / A	D
Chile	N	n.a.	Y	20	−20	I	N	N	L	A / A	W
Costa Rica	N	n.a.	Y	100	−100	I	N	Y	L	A / N	M
Croatia	10	I,C	Y	20	−20	I	Y	Y	L	A / A	D
Honduras	N	n.a.	Y	5	−5	I	Y	N	S	N / N	M
Latvia	10	I	Y	–	–	I	Y	Y	L	A / A	M
Lebanon	12	C	Y	–	–	I,C	Y	Y	L	A / N	M
Peru	9.1	I	Y	100	−2.5	I	Y	Y	L	A / A	M
Poland	8	I,C	N	n.a.	n.a.	n.a.	Y	Y	L	A / A	D,M
Romania	8	I,C	Y	20	−20	I	N	N	L	A / N	D
Singapore	8	I,C	N	n.a.	n.a.	n.a.	N	Y	n.a.	A / A	M
Slovenia	8	I,C	Y	n.a.	n.a.	n.a.	Y	Y	L	A / N	Q
Sweden	8	I,C	N	n.a.	n.a.	n.a.	N	Y	M	A / A	Q
Turkey	8	I,C	Y	20	−20	I	Y	Y	S	A / N	W,M
Uruguay	N	n.a.	Y	–	–	I	N	Y	L	A / N	D,M

1. In Poland, the capital requirements are 8 per cent for a foreign exchange open position if its value exceeds 2 per cent of the bank's own funds, and 0 per cent for an open position which do not exceed 2 per cent of own funds. Whereas in Brazil the capital requirements are 50 per cent of foreign exposures exceeding 5 per cent of capital.
2. Applicable on an individual (I) or consolidated basis (C). Data not available for Argentina, Bolivia, Chile, Costa Rica, Honduras and Uruguay.
3. In Slovenia banks are required to establish their own internal limits on foreign exchange exposures. Sweden and Poland do not have limits.
4. No data available for Latvia, Lebanon and Uruguay (–).
5. Applicable on an individual (I) or consolidated basis (C). Data not available for Poland, Singapore and Sweden.
6. Data not available for Argentina.
7. Long (L), short (S) or matched (M). Data not available for Singapore.
8. Active (A) or not active (N). First answer corresponds to spot markets and the second to the forward markets.
9. D: Daily; W: Weekly; M: Monthly

loans in the Costa Rican financial system are estimated to be granted in dollars to borrowers who do not generate foreign exchange revenue. Other supervisors report using information on debtors' activities, the purpose of the loan and on the sector composition of exports and imports to make inferences about banks' exposure to un-hedged borrowers (Uruguay). On this basis, it is reported that Uruguayan banks granted 74 per cent of their loans to un-hedged borrowers in June 2004.

Prudential rules

Few countries have implemented prudential rules aimed at controlling banks' exposures to currency-induced credit risk. None of the responding countries report using higher capital requirements for foreign currency assets, relative to domestic currency assets.[25] However, some highly dollarized countries have capital requirements that are higher than the 8 per cent minimum CAR recommended by the BCBS (Figure 8A1.1). Only one country (Peru) reports requiring higher provisions for foreign currency loans relative to domestic currency ones. In addition to Peru, five other countries (Singapore, Poland, Lebanon, Argentina and Chile) report that banks are expected to assign a higher risk rating to debtors whose capacity to repay is sensitive to exchange rate movements, in the context of their overall risk assessment of borrowers.

Limits or other restrictions are used by some countries with low degrees of dollarization (Brazil, Chile and Honduras) and by Argentina, formerly highly dollarized until the legal pesification (see Table 8A1.2). For instance, Brazil prohibits banks from granting loans in foreign currencies, but allows foreign currency-indexed loans. Chile requires that banks approve and report to the Superintendency, internal policies for the management of these credits prior to engaging in this type of business. Honduras has a limit of 15 per cent of foreign currency deposits that can be allocated to grant foreign currency loans to non-exporters. Argentina's current legal framework[26] stipulates that funds from foreign currency deposits should be allocated to foreign trade-related financing, inter-financial loans or Central Bank

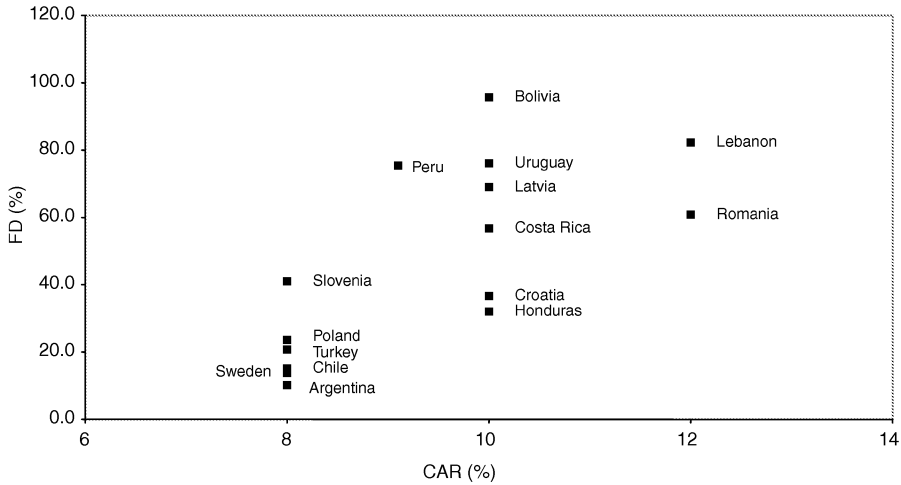


Figure 8A1.1 Financial dollarization (FD) and capital requirements (CAR) for selected countries, 2004[1,2]

Source: IMF.

Note: 1. Capital requirement ranges from 8 to 10 for Argentina and from 8 to 12 for Slovenia.
2. Foreign currency loan data not available for Brazil and Singapore. Information on foreign currency deposits for Lebanon as of 2003.

Table 8A1.2 Credit risk regulations for selected countries

Country	Capital requirements for credit risk		Specific rules for credit risk exposures to un-hedged borrowers						
	Capital requirements	Type[1]	Higher capital requirements	Higher provisions	Higher generic provisions	Limits or prohibitions	Hedging requirements	Higher risk rating expected	Banks required to approve internal policies and inform supervisory agency
Argentina	8 to 10	I,C	N	N	N	Y	N	Y	N
Bolivia	10	I	N	N	N	N	N	N	N
Brazil	11	C	N	Y	N	Y	N	N	N
Chile	8	C	N	N	N	N	N	Y	Y
Costa Rica	10	I	N	N	N	N	N	N	N
Croatia	10	I,C	N	N	N	N	N	N	N
Honduras	10	I	N	N	N	Y	N	N	N
Latvia	10	I,C	N	N	N	N	N	N	N
Lebanon	12	C	N	N	N	N	N	Y	N
Peru	9.1	I,C	N	Y	Y	N	N	Y	N
Poland	8	I,C	N	N	N	N	N	Y	N
Romania	12	C	N	N	N	N	N	N	N
Singapore	10	I,C	N	N	N	N	N	Y	N
Slovenia	8 to 12	I,C	N	N	N	N	N	N	N
Sweden	8	I,C	N	N	N	N	N	N	N
Turkey	8	I,C	N	N	N	N	N	N	N
Uruguay	10	I,C	N	N	N	N	N	N	N

Source: IMF.

1. Applicable on an individual (I) or consolidated (C) basis.

bills. In case of misallocation, there is an increase in liquidity requirements deposited at the Central Bank.

Supervisory guidelines

Six of the surveyed countries have explicitly required banks to manage and control their currency-induced credit risk. For instance, in Lebanon and Peru, banks are required to gather data and perform an analysis that allows them to assess the extent of their borrowers' exposure to a currency depreciation. General guidelines recommend that banks assess the borrower's ability to generate foreign currency cash flow to hedge against a possible change in the exchange rate. In Poland, the General Inspector of Banking Supervision has issued guidance letters on the management of risks stemming from foreign currency lending.

Few countries conduct regular stress testing to estimate banks' exposure to credit risks derived from borrowers' currency, interest rates or maturity mismatches (see Table 8A1.3). Peru requires financial institutions to conduct annual stress tests to measure the impact of a 10 per cent and 20 per cent depreciation of the domestic currency on the repayment capacity of debtors in the loan portfolio. Uruguay and Romania also report conducting some stress tests to measure the impact of a currency depreciation on the loan portfolio, but these do not appear to be prepared on a regular basis. None of the responding countries report having conducted stress tests to measure banks' exposure to credit risk derived from borrowers' interest rates or maturity mismatches. However, four countries perform scenario analysis measuring the impact of changes in several macroeconomic variables on banks' balance sheets, including, among others, changes in exchange rates, interest rates, inflation and GDP growth (Singapore, Poland, Slovenia and Lebanon). In Singapore and Slovenia the supervisory authority has issued recommendations for banks to conduct these tests. In contrast, in Poland and Lebanon these stress tests are mandatory for banks.[27]

Supervisory assessment and preventive action

Banks' credit risk management policies and practices are generally examined during on-site examinations. In this process, some countries report assessing the overall credit risks of banks (Croatia, Poland, Slovenia, Lebanon and Honduras) and others report conducting a specific assessment of the exposures to credit risk from foreign currency loans to un-hedged borrowers (Singapore, Lebanon and Uruguay). In Singapore, the supervisory authorities perform independent assessments of banks' exposure to credit risk from foreign currency loans during both off-site review and the on-site examination process. In Lebanon, for large borrowers (with facilities exceeding 15 per cent of the bank's capital, or $5 million, whichever is less), this assessment includes credit risk from foreign currency loans to un-hedged borrowers. Uruguay makes a general classification of a bank loan portfolio in the 'tradable' vs. 'non-tradable' sector, and analyzes the portion of loans in the non-tradable sector that is denominated in foreign currency.

Most countries report that hedging instruments are available in their markets for borrowers to hedge against foreign currency risks; however, the extent of their use by borrowers is not known. Only a few countries have very active markets (Singapore, Sweden, Poland and Brazil) with a wide variety of available instruments. Most of them have shallow markets, with one or two main instruments offered, mostly forward contracts with the exchange rate as the underlying variable (Croatia, Romania, Slovenia, Lebanon and Peru).

Most dollarized countries surveyed report that banks appear not to be pricing the foreign currency risk derived from un-hedged currency mismatches (Croatia, Slovenia, Turkey, Honduras and Uruguay). Banks tend to operate under the assumption that the authorities will keep the current exchange rate regime. The fact that this could be very costly and may not always be true fails to be priced in. Uruguay explicitly mentions this as a problem, and reports seeking to discourage this behaviour by requiring banks to take this mismatch into consideration when rating and provisioning borrowers. Four countries (Singapore, Sweden,

Table 8A1.3 Credit management and stress-testing practices

	Supervisory guidelines		Stress tests					
Country	Credit risk management guidelines	Guidelines on managing credit risk of borrowers' currency mismatches	Stress tests for credit risk from borrowers' currency mismatches	Supervisory guidelines for the stress tests	Stress tests for credit risk from borrowers' interest rate mismatches	Stress tests for credit risk from other market variables	Scenario stress tests (simultaneous shocks: i.e., GDP, reduced credit access)	Disclosure requirements on credit risk exposures to un-hedged borrowers
Argentina	Y	Y	N	N	N	N	N	N
Bolivia	Y	N	N	N	N	N	N	N
Brazil	N	n.a.	n.a.	n.a.	N	N	n.a.	n.a.
Chile	N	N	N	N	N	N	N	N
Costa Rica	N	N	N	N	N	N	N	N
Croatia	N	N	N	N	N	N	N	N
Honduras	N	N	N	N	N	N	N	N
Latvia	Y	N	N	N	N	N	N	Y
Lebanon	Y	Y	Y	Y	N	N	Y	Y
Peru	Y	Y	Y	Y	N	N	N	N
Poland	Y	Y	Y	Y	N	N	Y	N
Romania	N	N	Y	N	N	N	Y	N
Singapore	Y	Y	Y	Y	N	N	Y	N
Slovenia	Y	N	Y	N	N	N	Y	N
Sweden	Y	n.a.	n.a.	n.a.	N	N	Y	n.a.
Turkey	Y	N	N	N	N	N	N	N
Uruguay	Y	Y	Y	N	N	N	N	N

Source: IMF.

Lebanon and Costa Rica) report that interest rates charged by banks are a function of the overall risk of the borrower, which may include risks associated with the sensitivity of their capacity to repay in the event of exchange rate movements. In turn, three countries (Latvia, Poland and Romania) report that they have specifically identified that banks charge higher interest rates to borrowers with currency mismatches.

Liquidity risk

Data collected by supervisory authorities

Fourteen of the seventeen countries report collecting some information on liquidity risks on a currency-specific basis. Eleven of these collect information on maturity mismatches in each of the currencies that are significantly important, including three countries with low financial dollarization. Some countries collect reports on maturity mismatches based on contractual maturity and adjusted behaviour profiling (Singapore and Chile), others (Peru) do it based on adjusted behaviour only (Table 8A1.4).

Prudential rules

Measures have been taken to reduce the vulnerabilities of financial systems to liquidity risks that could arise from financial dollarization. The specific modalities of these arrangements vary across countries, though commonly countries utilize a combination of prudential measures. The most common combination is that of minimum liquidity ratios and reserve requirements.[28] Some dollarized countries have high minimum requirements to build a buffer for liquidity risks. Others also apply higher requirements for foreign currency relative to domestic currency liabilities.

All the countries surveyed have minimum reserve requirements, with the exception of Sweden, and nine of them also have minimum liquidity ratios. The design of these instruments varies, though typically most countries require that liquid assets are held in the same currency as the liabilities they are expected to cover. Some countries apply higher rates for shorter maturity liabilities (Bolivia, Brazil, Chile and Uruguay) and others require higher rates for foreign currency deposits relative to domestic currency ones (Romania, Turkey, Lebanon, Argentina, Bolivia, Peru and Uruguay). A combination of average and marginal reserve requirements (Croatia and Peru) is used by some countries. For instance, in Peru there is a 30 per cent marginal reserve requirement for all foreign currency deposits and some liabilities with foreign financial institutions. Reserve requirements are compensated in most countries, albeit usually at below market interest rates. Some countries have established minimum liquidity requirements that apply only to foreign currency liabilities (Croatia, Slovenia and Honduras).

Four countries (Romania, Slovenia, Chile and Honduras) impose limits on maturity mismatches of banks' assets and liabilities and one (Argentina) is considering imposing such a limit. In all these cases, the limits appear to be defined in terms of residual contractual maturities. Limits can be defined for one or two particular time buckets, as in Slovenia, Chile and Honduras, or for all time buckets on a cumulative basis, as in Romania. All of these countries define limits for the overall mismatches of domestic and foreign currencies. However, two countries set an independent limit – for one currency only – on the mismatch for the 30 days time band: foreign currency in Chile and domestic currency in Honduras.

Supervisory guidelines

Most countries have issued regulations or some sort of supervisory guidelines requiring banks to set appropriate policies and practices to manage liquidity risks. Some countries, such as Croatia, have issued these in the context of general risk management rules. Others, such as Slovenia and Bolivia, have issued specific regulations on liquidity risks. Only two countries, Latvia and Lebanon, have set explicit recommendations to manage foreign currency liquidity risks. In Lebanon, for instance, the 'Generic Risk Management Manual'

Table 8A1.4 Liquidity risk management practices

	Data collection[1]					Prudential rules									
						Liquidity requirements			Reserve requirements						Other
	On currency-specific liquidity	On currency-specific maturity gaps	On concentration of liabilities	On sources of funding	On marketability of assets	Rates for domestic currency	Rates for foreign currency	Differentiated by maturity	Rates for domestic currency	Rates for foreign currency	Differentiated by maturity	Marginal rate for domestic currency	Marginal rate for foreign currency	Interest paid	Limits on maturity gaps
Argentina	Y	Y	Y	Y	Y	n.a.	n.a.	n.a.	0 to 18	0 to 35	Y	N	N	Y	N
Bolivia	Y	N	Y	Y	N	0 to 10	0 to 10	Y	0 to 2	0 to 2	Y	n.a.	n.a.	Y	N
Brazil	N	N	Y	Y	N	8 to 45	n.a.	n.a.	15 to 45	n.a.	N	n.a.	n.a.	N (*)	N
Chile	Y	Y	Y	Y	Y	n.a.	n.a.	n.a.	3.6 to 9	3.6 to 9	<1 year	n.a.	n.a.	Y	Y
Costa Rica	Y	Y	N	FS	N	n.a.	n.a.	n.a.	10	10	N	n.a.	n.a.	N	N
Croatia	Y	N	Y	Y	Y	n.a.	35	N	19	19	N	24	24	Y	N
Honduras	Y	N	N	Y	N	n.a.	38	N	12	12	N	n.a.	n.a.	N	Y
Latvia	n.a.	Y	N	Y	N	30	30	<30 days	4	4	n.a.	n.a.	n.a.	Y	N
Lebanon	Y	Y	Y	Y	Y	10	10	n.a.	n.a.	15	<1 year	n.a.	n.a.	Y	N
Peru	Y	Y	Y	Y	Y	8	20	<1 year	6	6	N	n.a.	30	Y	N
Poland	n.a.	Y	Y	Y	N	n.a.	n.a.	n.a.	3.5	3.5	N	n.a.	n.a.	Y	N
Romania	Y	Y	Y	N	N	n.a.	n.a.	n.a.	18	30	<2 years	n.a.	n.a.	Y	Y
Singapore	Y	Y	N	Y	FS	18	18	N	3	3	n.a.	n.a.	n.a.	N	N
Slovenia	Y	Y	N	Y	N	n.a.	100	<6 months	2 to 4.5	2	<2 years	n.a.	n.a.	Y	Y
Sweden	N	N	N	FS	FS	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	N
Turkey	Y	Y	N	Y	Y	n.a.	n.a.	n.a.	6	11	N	n.a.	n.a.	Y	N
Uruguay	N	N	N	FS	FS	30	30	<1 year	4 to 17	19 to 25	Y	n.a.	n.a.	Y	N

Source: IMF.

1. FS indicates this information is only collected through bank's financial statements.

(*) Some types of the deposits are remunerated.

includes specific requirements to assess any form of mismatch in each foreign currency, determine alternative sources of financing and consider committed lines of credit in foreign currencies.

In nine of the seventeen countries, banks are required to use stress-testing techniques to estimate the impact of market and other changes on their liquidity. Some regulators have explicit requirements for these stress tests. For instance, in Singapore, banks are required to examine their cash flows under bank-specific crisis and general market crisis scenarios. In Sweden, the FSA guidelines on these scenarios require banks to measure payments and to analyze liquidity risks for each currency separately where the bank is exposed. In Lebanon, banks are expected to simulate various scenarios considering market changes in terms of currency, instruments, volumes, maturity, rates and products. In most countries the parameters and specific conditions for these scenarios are to be defined by the banks. An exception is Peru, where the regulation sets an explicit stress scenario for banks to run. In this latter case, while the scenario conditions are equal for both currencies, the liquidity risks are to be assessed independently for each currency.

Contingency plans for adverse liquidity conditions are required in thirteen out of the seventeen countries. Wherever stress testing is required, the plan is generally designed to solve the specific conditions and vulnerabilities identified in the stress scenarios. Most supervisors review contingency plans during the on-site examination process, including Bolivia and Uruguay, which have no formal requirements for these plans to be formulated. In Poland, Turkey and Peru, the contingency plans are reviewed during the off-site as well as the on-site supervisory processes. One country (Sweden) restricts this review to the systemically important banks.

Supervisory assessment and preventive action

Most countries conduct an off-site review of banks' liquidity on the basis of reports submitted by banks, and assess liquidity risk management during on-site examinations. These assessments generally focus on overall liquidity risks, and rarely look into specific aspects related to foreign currency operations. An exception is Poland, where supervisors conduct a specific assessment of liquidity risks arising from banks' foreign currency operations for cases in which these are considered significant. In particular, Poland's assessment of risks associated with foreign currency operations looks into the status and prospects of sources of funding, off-balance-sheet operations impacting liquidity risk levels, the impact of subsidiary cash flows on the bank's liquidity and the impact on liquidity of foreign currency-induced credit risk, among others. Besides examining liquidity risks of individual institutions, some supervisors also conduct an assessment of systemic liquidity conditions and risks (Croatia, Lebanon, Brazil, Peru and Uruguay) and in the case of Latvia this assessment is done by the Central Bank. The Central Bank of Brazil, for instance, conducts system-wide stress tests for all financial institutions in the financial system, identifying vulnerable institutions and their related entities and feeding back these results to bank supervisors, in order to design appropriate corrective actions.

Institutional framework and market conditions

Under normal conditions, banks have access to a wide variety of sources of funds in foreign currency, but some of these may not be accessible under adverse liquidity conditions. To protect against liquidity risk, some countries with a significant share of foreign currency liabilities hold high levels of international reserves of the central bank and or commercial financial institutions (see Figure 8A1.2). While reserves of commercial banks are immediately available to attend to banks' liquidity needs, central bank international reserves are made available through foreign exchange operations or liquidity facilities. Thus, some central banks provide liquidity in foreign currency, under normal or under exceptional circumstances. In six countries liquidity facilities are available only in domestic currency (Singapore, Croatia, Latvia, Argentina, Brazil and Honduras). Lebanon, Bolivia, Chile and Peru have open liquidity

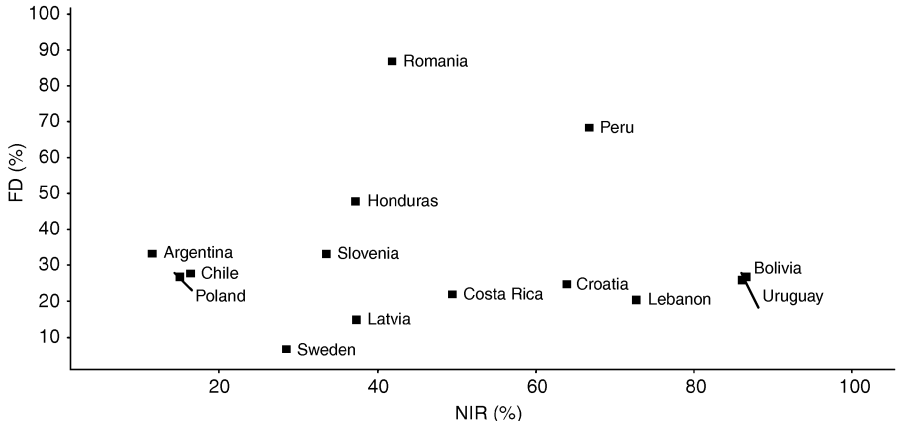


Figure 8A1.2 Financial dollarization (FD) and international reserves (minus gold) for selected countries, 2004

Source: IMF.

facilities in foreign currency that can be accessed regularly by banks. In Lebanon, these include: discount of commercial bills or of foreign currency reserve requirements, repos of Lebanese Eurobonds, overdrafts collateralized with commercial bills, gold or securities and purchases of bills or government bonds. In Bolivia, the Central Bank provides liquidity against banks' reserves deposited abroad and through repos of Central Bank or government securities. In Peru and Chile liquidity in foreign currency is provided against banks' reserve requirements deposited at the central bank. In Sweden and Slovenia the central bank provides liquidity in foreign currency through currency swaps. Several countries (Sweden, Poland, Lebanon, Costa Rica, Peru and Uruguay) provide lender of last resort credit in foreign currency, against eligible collateral. Eligible collateral can be limited to government or central bank paper and other first-class securities. Some countries, however, accept loans as collateral (Sweden, Bolivia, Costa Rica, Peru and Uruguay).

Appendix 8.2 Currency-induced credit risk in selected banking systems

The purpose of this section is to provide a measure of the currency-induced credit risk in selected Latin American and European banking systems. To that end, using aggregate bank data, we estimate a relationship between exchange rate movements and indicators of credit risk, such as the NPL and provisioning ratios.

The econometric estimation of the effect of exchange rate movements on the NPL ratio requires controlling for other macroeconomic variables likely to affect the credit quality of borrowers, including GDP growth, interest rate on bank loans and inflation. To avoid marked seasonality effects, all the variables are expressed in annual growth rates except for the interest rate, where the annual average rate is used.[29] The choice of a particular dynamic-specification for the regressors was guided by minimizing the sum of the squared errors. For all countries, the preferred specification includes one lag of the independent variables. However, a more general dynamic specification, allowing for lags up to one year, was also estimated, with similar results. Hence, given data availability constraints a more parsimonious dynamic specification was chosen.[30]

Table 8A2.1 reports the results of the estimation of indirect credit risk for selected countries with publicly available time series information on the ratio of NPLs to total loans. As expected, a depreciation of the domestic currency increases the growth rate of the NPL ratio in Peru, Bolivia and Poland. However, a depreciation has no statistically significant effect in Brazil, Chile and Slovakia. In all countries we found a significant effect of output deceleration and rises in interest rates on the growth of NPLs. To the extent that inflation reduces the real value of loans and facilitates their repayment, a negative relationship is to be expected between inflation and NPL growth. This effect is found statistically significant in Peru; however, for the other countries it is found not to have a significant effect with the exception of Bolivia, where the opposite effect is found.[31]

Alternatively, credit risk in the banking system can be proxied by the ratio of provisions to total loans. Following the same methodology used in the estimation of the annual growth of NPLs, we estimate the impact of a depreciation on the annual growth of provision expenditures as a share of loans. Table 8A2.2, in column 3, reports the estimation results, which are qualitatively similar to the results of the estimations of the NPL growth rate (information on the ratio of provisions to total loans was only available for Peru).

Disaggregated information on the credit quality of loans by type of currency and by type of loan (i.e., consumer, mortgage or corporate) allows for a more accurate estimation of the effects of depreciation. The estimated effect of depreciation on the total NPL or provisioning ratio would help predict future effects of devaluation only if the degree of banking system dollarization remains broadly stable. For example, if dollarization has been increasing, future depreciations will have a bigger impact since more borrowers will be negatively affected in the event of a depreciation. Changes in the composition of the bank's foreign lending portfolio are also important. Even if the degree of dollarization is stable, when the proportion of consumer and mortgage loans increases, the indirect exchange rate risk is also likely to increase, since retail borrowers are typically un-hedged. Table 8A2.2, in columns 2 and 4, shows the results for foreign currency NPLs and provisions. The regressors are also modified accordingly by replacing the average lending rate for the lending rate on foreign currency loans. The results are qualitatively similar to those of total NPLs and provisions, yet, as expected, the effect of depreciation turns out to be more pronounced in both cases.

Table 8A2.1 Estimates of annual NPL growth rates in selected banking systems

	Brazil	**Bolivia[1]**	**Chile**	**Peru**	**Poland**	**Slovakia**
Depreciation	−.06	6.9**	−.02	1.57**	.47**	−.01
Production growth	−1.45**	−7.5**	−4.73**	−.91*	−.64**	−1.13*
Interest rate	1.0**	3.3**	4.0**	5.0**	3.0**	1.0**
Inflation	.60	1.5*	.49	−5.4**	.61	−.24
Adjusted R^2	.55	.58	.67	.82	.66	.30
Observations	98/01−04/01	90:Q1−04:Q3	97/02−04/10	94/12−04/09	99/11−04/04	96/01−04/09

Note: Staff's own estimates based on monthly data, except for Bolivia, where quarterly data are used. '*', '**' indicate statistical significance at the 90 and 95 per cent level respectively, based on Newey-West heteroskedasticity-autocorrelation consistent variance-covariance matrix.

1. A dummy variable from 1999–2004 is included in the specification for Bolivia to capture structural changes in the economy and the financial system, including the increased foreign bank participation and changes in prudential norms.*

* A 2004 study by the Central Bank of Bolivia on a similar topic (Escobar, 2004) also includes a 1999–2004 dummy to correct for a structural break.

Table 8A2.2 Peru: estimates of annual provision to loan growth rates

	NPL to loan ratio	Foreign currency NPL to foreign currency loan ratio	Provisions to total loans ratio	Foreign currency provisions to foreign currency loan ration
Depreciation	1.57**	1.95**	1.32**	1.90**
Production growth	−.91*	−1.23**	−.51	−.81**
Interest rate	5.0**	2.0**	5.0**	2.0**
Inflation	−5.4**	−5.47**	−5.3**	−5.14**
Adjusted R^2	.82	.85	.82	.78
Observations	12/94–09/04	12/94–09/04	12/94–09/04	12/94–09/04

Source: Staff's own estimates.
'*', '**'indicate statistical significance at the 90 and 95 per cent level respectively, based on Newey-West heteroskedasticity-autocorrelation consistent variance-covariance matrix.

Table 8A2.3 Effect of an exchange rate shock (ERS) on NPLs' and provisions' annual growth rate

	Indicators of currency mismatch and corporate leverage			
	Effect of ERS	Average loan dollarization	Export/GDP	Corporates' debt/asset
Total NPLs				
Brazil[1]	0.0	13.2	10.6	33.0
Bolivia	6.9	97.0	20.8	43.0
Chile[1]	0.0	17.6	30.5	30.0
Poland	0.5	22.7	27.4	17.0
Slovakia[1]	0.0	12.9	64.9	–
Case study: Peru				
Total NPL ratio	1.6	79.3	14.9	33.0
Total provisioning ratio	1.3	79.3	14.9	33.0
Foreign currency NPL ratio	2.0	79.3	14.9	33.0
Foreign currency provisioning ratio	1.9	79.3	14.9	33.0

Note: 1. Estimates in the case of Brazil, Chile and Slovakia were not statistically different from zero.

The quantitative effect on credit risk of an exchange rate shock varies substantially across countries and appears to be a 'threshold effect' related to the degree of dollarization. In particular, Table 8A2.3 shows a very large effect for Bolivia – a 1 per cent depreciation leads to a 6.9 per cent increase in NPLs. The large effect appears to be related to (i) the large proportion of dollar lending (97 per cent of foreign currency loans), (ii) very high corporate debt and (iii) a relatively low share of tradable goods (especially when abstracting from hydrocarbon-related exports). Peru also presents a relatively large effect (1.6 per cent) as well as a high degree of dollarization (79 per cent). In Poland, with a moderate dollarization rate, the quantitative impact of depreciation is much less pronounced (0.5 per cent). In contrast, those countries where the level of dollarization is comparatively low – Brazil (13 per cent), Chile (18 per cent), Slovakia (13 per cent) – an exchange rate shock has no statistically significant effect on credit risk. Also, in most countries, the size of the tradable sector (imperfectly measured by the share of exports in GDP) seems to correlate negatively with the quantitative impact on credit risk.

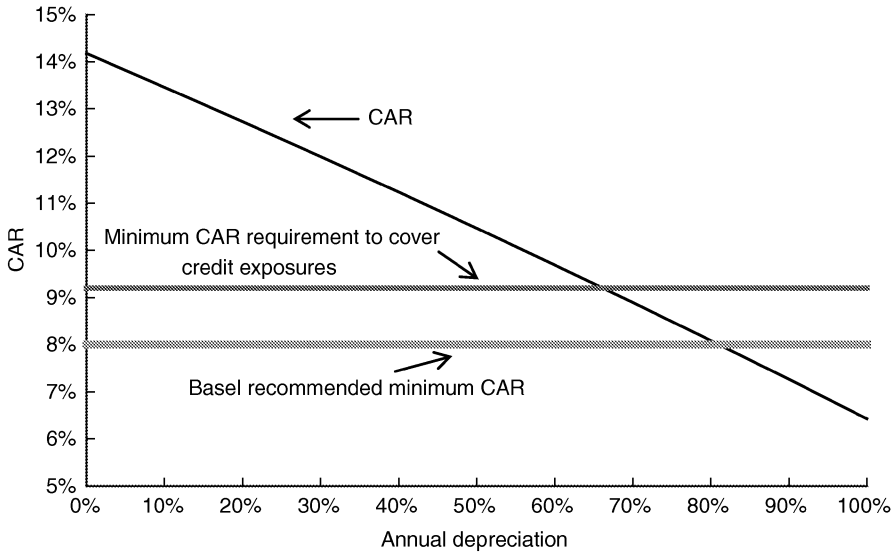


Figure 8A2.1 Peru: effect of currency-induced credit risk on the solvency of the banking system

The parameter estimates can be added to the set of early warning tools of risk management and bank supervision. Figure 8A2.1 shows the results of stress testing credit risk exposures to various-sized exchange rate shocks for Peru. The parameter estimate for foreign currency provisions in Table 8A2.3 together with information on profits, capital and risk-weighted assets (information available to risk mangers as well as to supervisors) can be combined to assess the effect of a given exchange rate shock on the capital adequacy ratio. According to our estimates, a 30 per cent devaluation will reduce the CAR from 14 to 12 per cent.[32] Furthermore, a 70 per cent devaluation will push the CAR below the minimum regulatory level (9.21 per cent). A similar analysis can also be used to determine the minimum CAR level necessary to withstand a given devaluation. For example, according to our estimates, the minimum CAR level to withstand a 20 per cent exchange rate shock would be 10.6 per cent.

Notes

1. The authors are grateful to Silvia Ramirez, Vania Etropolska, Moses Kitonga and Marie Carole St Louis for their valuable assistance. They also wish to thank Peter Hayward, Alain Ize, David Marston and Philip Turner, as well as the participants at the April 2005 Lima conference and an IMF seminar for valuable comments and suggestions. They are especially indebted to the supervisory authorities from the seventeen countries that responded to the questionnaire and provided comments on an earlier version of this chapter.
2. See Ize and Powell (2004), for a presentation of the need for prudential measures to reduce the vulnerabilities from dollarization.
3. These vulnerabilities have been extensively discussed in Gulde *et al.* (2004). See also de Nicoló, Honohan and Ize (2005).
4. See Calvo and Reinhart (2002).
5. Tornell and Westermann (2002) note that the incentive structure is sufficiently strong that small firms belonging to the non-tradable sector borrow more intensively in foreign exchange in periods of boom encouraged by bail-out guarantees and sometimes real

exchange rate appreciation. This explains the increase of the non-tradable to tradable output ratio in these periods.

6. Ize, Kiguel and Levy Yeyati (Chapter 9 in this volume) show that requiring banks to hold a minimum level of foreign currency liquidity in proportion to their foreign currency liabilities is a second-best policy that ensures that banks do not free-ride on the central bank LOLR, and that weaker banks do not benefit at the expense of stronger and more prudent banks.
7. See also Chapters 2 and 3, and Reinhart, Rogoff and Savastano (2003).
8. Current standards are contained in various documents of the BCBS (including 1997, 1999 and 2000).
9. The survey included six countries with more than half of total deposits in foreign currency (Bolivia, Croatia, Lebanon, Peru, Singapore and Uruguay), six countries with dollarization levels between 30 and 50 per cent (Costa Rica, Honduras, Latvia, Romania, Slovenia and Turkey) and five countries with low levels of dollarization (Argentina, Brazil, Chile, Poland and Sweden).
10. In August 2005, Uruguay approved higher capital requirements for foreign currency loans, by establishing a 125 per cent weight on these assets. This norm is scheduled to become effective in July 2006.
11. Current standards are contained in various BCBS documents (including 1997, 1999 and 2000).
12. BCBS (1998).
13. See Calvo and Reinhart (2002).
14. The calculation of the capital buffer assumes that the net FX open position in the banking system is similar to the degree of loan dollarization. However, if the degree of loan dollarization is above the net open position, a larger capital buffer would be needed (see Box 8.1 for details).
15. Banks' exposure to credit risk may be simultaneously affected by several market variables, including the exchange rate, interest rates, inflation and the level of economic activity. Authorities may consider these shocks individually or jointly, taking into account the correlations between these variables. While acknowledging this, the focus here is put on exchange rate shocks.
16. A long enough history, which includes the events leading to dollarization, is likely to also contain large exchange rate variations. However, these events might be hard to replicate under the improved monetary management applied in most highly dollarized countries in the recent past.
17. An additional complication occurs when authorities are committed not to devalue, as is the case in currency board regimes. From a prudential point of view, authorities may still want to build up a buffer against this unlikely event. The way this buffer is communicated is particularly important in this case, so as not to create mixed signals or self-fulfilling prophecies.
18. Other potential costs may arise as banks seek to elude the added cost of doing banking business. These include the possibility of disintermediation and regulatory arbitrage, which are more difficult to assess.
19. In the first case, the liquid assets are managed by banks, whereas in the second case, these are managed by the central bank, and are mostly constituted by central bank liabilities.
20. For a detailed presentation of these issues, see Gulde *et al.* (2004).
21. Four responding countries are members of the European Union (EU) (Latvia, Poland, Slovenia and Sweden) and three countries are European non-EU members (Croatia, Romania and Turkey). There is also one Asian country (Singapore), one country from the Middle East (Lebanon) and eight countries from the western hemisphere region (Argentina, Bolivia, Brazil, Chile, Costa Rica, Honduras, Peru and Uruguay).
22. *Financial dollarization* is measured here as the share of foreign currency deposits over total deposits. The term *dollarization* is used for all countries, although in some of these countries the foreign currency of choice is not the US dollar, but the euro.
23. See Abrams and Beato (1998).

24. For instance, Uruguay considers 'borrowers receiving loans in foreign currency, whose cash flow to repay loans is in local currency'. Poland regards an un-hedged debtor as one 'that does not have the natural hedging, e.g., cash inflows denominated in foreign currencies, and does not secure his exposure on derivative market'. In contrast, Honduras and Costa Rica have definitions that refer only to the capacity of the debtor to generate foreign currency.
25. In Uruguay, higher capital requirements for foreign currency loans are to become effective in July 2006, by establishing a 125 per cent risk weight on these assets. A similar approach has been adopted by Georgia, a country not in the survey, where a 200 per cent risk weight is applied to foreign currency assets for the calculation of the minimum required capital to risk weighted assets ratio.
26. Article 23 of Decree 905/02 and related Central Bank regulations.
27. Although some countries require banks to disclose to the public their credit policies and, in general, the major risks that they are exposed to, there is no specific requirement to disclose credit risks emerging from lending to un-hedged borrowers.
28. Reserve requirements have been traditionally regarded as a monetary policy instrument to assist authorities control the money supply, as eligible assets required for compliance – cash and deposits at the central bank – are also central bank liabilities (base money). However, they have also been viewed as a special type of liquidity ratio and, as such, have been used as a prudential tool, operating as a buffer stock to face liquidity shocks.
29. The rationale is that interest rate *levels* are more relevant than interest rate *changes* in explaining changes in NPLs and provisions.
30. The econometric estimates are based on monthly data on NPL of the banking system, total loans of the banking system, average lending rates, real GDP (when not available, industrial production index was used instead) and the exchange rate with respect to the dollar or to the euro (for pre-1999 data, the euro rate was replaced with the Deutsch mark rate). Data were collected from January 1990 to the latest date for which observation are available for Brazil, Bolivia, Chile, Peru, Poland and Slovakia. The choice of this particular country set was guided by data availability among those emerging or developing economies with dollarized/eurorized banking systems. In most cases, complete data sets were only available from the mid-1990s. For Bolivia, only quarterly data were available (1990:Q1–2004:Q3). For Peru, data on total provisions, foreign currency NPLs and provisions were also collected. All data were downloaded from the international financial statistics (IMF), the web pages of the corresponding central banks, supervisory agencies and national statistical offices.
31. One possible rationale for the insignificant effect of inflation on NPL growth in Chile (and, to a lesser extent, in Brazil and Poland) could be the use of inflation-indexed contracts.
32. Simulations assume that additional provision requirements due to depreciation cannot be met with profits, only with existing capital.

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Comments on Chapter 8

Julio de Brun

The authors have embarked on the ambitious and welcome task of adapting the recommendations of the Basel Committee on Banking Supervision to the problems arising in highly dollarized economies. The result is a comprehensive set of recommendations that should be taken into account by supervisors in emerging economies facing the particular issues raised by dual currencies.

The chapter's contributions are also contrasted with the results of a survey conducted among seventeen countries about supervisory practices in relation to the problems of dollarization. This survey shows that supervisory practices focus on foreign exchange and liquidity risks, with less effort being made to address currency-induced credit risk. This result is not unexpected, given that liquidity risks and foreign exchange positions have been traditionally addressed by regulation, while currency-induced credit risk has received attention only more recently, following the significant impact on banks' financial statements of the large changes in currency values during the 1980s and 1990s.

The chapter is organized around the three risks associated with dollarization in financial systems: foreign exchange, credit and liquidity risks. I would like to focus these brief comments on two aspects of the analysis: the appropriate determination of the 'risk-free' position in foreign currency and the instruments available to deal with many of the recommendations concerning credit and liquidity risks.

Position in foreign currency

Regarding the definition of a 'risk-free' position in foreign currency, the authors prefer to protect the CAR instead of the level of bank's capital expressed in domestic currency. The traditional definition of a position in foreign currency, which is assets net of liabilities in foreign currency, is related to the second definition. If assets in foreign currency are equal to liabilities, changes in the nominal exchange rate have no impact on the capital of the bank, when denominated in domestic currency. However, the authors show that the CAR is affected negatively in the event of an exchange rate depreciation, given that the nominal value of the dollar assets rises, while the value of equity remains constant.

Indeed, if the goal of the supervisor is to isolate the CAR from movements in the exchange rate (in fact, in highly dollarized economies the sensitivity of the CAR to movements in the exchange rate is very high if the positions are closed), then the regulation should define the 'risk-free' position in a slightly different way. In this case, a position in foreign currency is neutral from the point of view of the CAR, not if assets net of liabilities in foreign currency equal zero, but if they equal instead the net worth of the bank multiplied by the share of foreign currency assets over total assets. Under that rule, in the event of variations in the exchange rate, the net worth of the bank will change due to the difference between assets and liabilities in foreign currency in the amount exactly needed to match the increase in the value of assets, so that the CAR remains constant.

However, I am not convinced that the goal of the supervisor should be to stabilize the CAR with regard to variations in the exchange rate. If the CAR was initially high enough with respect to the minimum thresholds determined by the regulation to resist the impact of a devaluation of the currency, the regulator should not consider exchange rate fluctuations to be a problem. And if for the same reason the CAR falls below the minimum established, it should not be a problem very different from those related to other causes of fluctuations in the CAR.

The argument of the authors is valid in terms of volatility. Probably no other factor can have the same major impact on the CAR as changes in the value of the currency if a large portion of a bank's assets are dollarized. However, stabilizing the CAR against exchange rate fluctuations could introduce greater volatility in returns, which should also be a cause for concern for the supervisor.

Finally, from a general economic viewpoint rather than from that of a supervisor, the goal of de-dollarization is precisely to introduce incentives to close positions in foreign currency. From this perspective, it might be difficult to justify a bought position, as the positions of financial agents in the market are often considered to be an important signal for the rest of the economy.

At the end of the day, this discussion is more philosophical than practical. In highly dollarized economies banks often work with bought positions in foreign currency, not because of concerns about the CAR but for different reasons. In highly dollarized economies, the dollar has in great part replaced the local currency as a unit of account. Economic agents therefore try to maintain the value of the net worth in dollars, not in domestic currency. This is especially true for foreign banks, which for reasons of consolidation are usually required to concern themselves with results in foreign currency. Under this framework, a closed position in foreign currency means, in the case of a positive net worth, a bought position in domestic currency, which is 'risky' if the unit of account is the dollar or other foreign currency. Instead, having a bought position in foreign currency, when allowed, closes their position in domestic currency and reduces the volatility of the CAR to changes in the value of domestic currency.

Liquidity and currency-induced credit risk

While I basically share the views of the authors and their treatment of liquidity and currency-induced credit risks, I would like to mention the limitations that bank

officials and supervisors usually face when dealing with market risks, in particular with exchange rate volatility.

The authors recommend a great effort on the part of the banks to assess the sensitivity of their borrowers to fluctuations in exchange rates and interest rates. They also suggest that internal policies be defined with the aims of reducing exposure to customers facing currency mismatches and helping to reduce the currency mismatches of borrowers by offering hedging products and internalizing appropriately the risks of operating in different currencies. It is difficult not to share this view. However, this is easier said than done. One of the consequences of dollarization is precisely the virtual nonexistence of markets for domestic currency. The great proportion of assets denominated in foreign currency is the counterpart of the liability structure of banks, which in turn reflects the dominance of the foreign currency in non-financial sector portfolios. In that sense, the reduction of the vulnerability that high dollarization brings to the banking system must go hand-in-hand with policies that encourage the development of the domestic currency market. The construction of a yield curve for domestic currency through an active public debt management policy is the first step in that direction.

Regarding the development of capabilities to deal with currency-induced credit risk and liquidity risks, both at the bank and supervisory levels, the first step is to focus on the implementation of stress tests applied to the loan portfolio, and to assess its sensitivity to variations in the real exchange rate. These results should be used to feed banks' models of cash flows under assumptions that are common to all banks. At this stage, in which a lot of trial and error will be involved in the process of developing capabilities, the availability of comparable results under a common methodology is a preferred goal that overcomes the eventual risk of interpreting the common parameters as signals given by the supervisory agency. In any case, this misleading interpretation can be avoided if a clear separation is established between the supervisor and the monetary authorities.

9

Managing Systemic Liquidity Risk in Financially Dollarized Economies

Alain Ize, Miguel A. Kiguel and Eduardo Levy Yeyati[1]

9.1 Introduction

Dollarized economies have experienced in recent years a number of severe banking and currency crises in which runs on bank deposits, mainly dollar deposits, have played a major role.[2] The recent Argentinian currency and financial crisis and its tidal waves throughout the region, notably in Uruguay and Paraguay, has brought home the realization that dollarization can greatly complicate crisis management and create major financial vulnerabilities.[3]

While the issue of ascertaining whether these crises were self-fulfilling or driven by deteriorating fundamentals is outside the scope of this chapter, it is clear that systemic runs in dollarized economies have an important self-fulfilling component.[4] On the one hand, dollar deposits can only be paid off to the extent banks have sufficient dollar liquidity or sufficient access (through LOLR arrangements) to dollar liquidity on-lent by the central bank. In a highly dollarized fractional reserve banking system, only a limited proportion of bank deposits can be backed this way. At the same time, many factors exacerbate the run, once it is under way. In addition to incurring potential losses through the firesale of bank assets, depositors that are left in the banks face the threat of last resort measures designed to stop the run, including deposit freezes.

The rationale for running is even more compelling in a mixed-currency economy than in a peso economy or a fully dollarized economy, as threats loom of forced conversions into pesos, large exchange rate depreciations, or some combination of the two (as in the midst of the Argentinian crisis of 2002). The exchange rate is typically floated to stem runs on peso deposits – including after a forced conversion that broadens the peso deposit base – or to limit the loss of international reserves – including after banks are given LOLR support in pesos to meet dollar deposit withdrawals. While freeing the exchange rate can be a lifeline for the peso (the resultant overshooting helps maintain it within the economy, if not within the banking system), it can be the 'nail in the coffin' for the dollar.[5] Indeed, it is likely to further deteriorate the quality of dollar loans, thereby worsening

banks' financial position and amplifying potential losses to depositors.[6] Expectations of such events therefore add fuel to runs, both on pesos and dollars, and enhance the probability that they will actually materialize.

This chapter deals with three basic issues at the core of systemic liquidity risk management in dollarized economies. First, in the absence of better alternatives, supervisory authorities in most financially dollarized countries have shown a distinct preference for dollar liquidity, in the form of a large stock of international reserves and/or substantial liquid asset requirements (LARs) on dollar deposits. However, large liquidity buffers are expensive in countries where country risk premia are high (which is typically the case in highly dollarized countries). Thus, it has been suggested that some form of insurance arrangement, such that commercial banks (or the central bank) can obtain automatic access to an external credit line in times of need, should be welfare improving. However, the chapter questions the validity of this assertion on both theoretical and empirical grounds. It also argues that the difficulties met so far in arranging such insurance contracts are unlikely to go away in the foreseeable future.

Second, the chapter discusses whether the liquidity buffer should be held in a centralized or decentralized manner, a question that has been barely addressed in the literature. With the help of a stylized example, we show that, in the absence of LARs, centralizing reserves at the central bank introduces an agency cost leading to suboptimal dollar liquidity holdings and an implicit subsidy to dollar intermediation. By contrast, decentralized holdings (through the imposition of LARs) help internalize the externalities of currency risk, at the cost of forgoing the potential diversification benefits of a common liquidity fund. In the context of largely systemic shocks, we conclude that the cost of the latter strategy is outweighed by its benefits: a positive LAR (and one greater than the one corresponding to peso deposits) is indeed optimal from a prudential perspective. However, we also argue that, once LARs have been introduced, it can make sense to put in place a limited dollar liquidity recycling facility designed to address idiosyncratic liquidity risk and further increase the resilience of the banking system.

Unless LARs are set at an extremely high level, resulting in a prohibitive cost, there will always be a remnant probability that the run will exhaust the available liquidity.[7] The question then is whether there are ways to stop the run in ways that are less traumatic than the last-resort measures cited above. The last section of the chapter proposes a scheme that supplements the LAR with the concept of 'circuit breaker' (CBR), i.e., a temporary, efficient and pre-programmed suspension of convertibility. The proposal combines the use of dollar liquidity earmarked to ensure the full convertibility of transactional dollar deposits with a mechanism that automatically reprogrammes dollar-term deposits once triggered by a sufficient decline in banks' liquidity. We conclude that the CBR, if well designed and accompanied by adequate prudential policies, including LARs and an efficient bank resolution framework, can both narrow the scope for destabilizing runs on the banking system and limit the cost of bank runs once they occur. We also suggest that a system with CBR-like properties could be de facto introduced without actually referring explicitly in the legal framework to the possible need for restructuring bank deposits in the event of systemic crises.

Section 9.2 reviews recent experiences with liquidity insurance. Section 9.3 argues in favour of LARs. Section 9.4 presents the case for CBRs. Section 9.5 concludes.

9.2 Can liquidity be borrowed?

Self-insurance versus external insurance

There are two ways in which a dollarized financial system can insure itself against a dollar liquidity shortage:

- *Self-insurance*, through the holding of a substantial stock of foreign currency-denominated liquid assets, either by the central bank, or by individual banks.
- *External insurance*, through a contract with private providers of dollar liquidity (typically, a consortium of financial institutions) or, alternatively, with IFIs that ensures financial institutions access to dollar liquidity at a reasonable cost.[8]

Whether the liquidity buffer is held by the central bank or by commercial banks, self-insurance entails a non-trivial cost (namely, the cost that the government or the financial institutions have to pay in excess of the return on liquid foreign assets to finance the purchase of the reserves), which combines a maturity and a sovereign risk premia. A back-of-the-envelope calculation would estimate this cost as the difference between the average yield of external debt (as measured, for example, by J.P. Morgan's EMBI index) and the return on central bank reserves, a non-negligible number for most emerging economies.

An insurance arrangement that guarantees access to funds in times of need would therefore seem to be more economical as it obviates the need for holding liquidity at all times, hence eliminates the associated carrying costs. Indeed, the insurer could be thought of as a fully credit-worthy financial entity which benefits from a comparative advantage in that it faces zero liquidity carrying costs.

Once adjusted for *effective risk coverage and seniority status*, however, the comparative advantage of insurance becomes questionable. This can be illustrated with a very simple example. Consider a central bank that holds foreign reserves to support banks under systemic bank runs. Assume that the probability of the run is p and the central bank loss in the event of a run is d. To further simplify, assume the central bank does not have capital and that its seignorage-generating capacity suffices to pay the carrying cost of its international reserves but is not sufficient to guarantee the full repayment of its debts under all states of the world. Thus, should the central bank accumulate reserves through a bond issue, it will partially default on its obligations if a run occurs. Assuming perfect capital markets and zero aversion, it will therefore need to pay a 'risk premium' on the bonds such that the expected return on the bonds equals the market rate:

$$(1 - p)(r^* + s) + p(r^* + s - d) = r^* \tag{1}$$

which implies:

$$s = pd \tag{2}$$

This is clearly the same as the premium on a fair-valued insurance: the insurer faces a loss *d* with a probability *p*, hence charges a premium *pd*. Indeed, unless the insurance market is deeper and more diversified than the bond market,[9] *as long as the risk coverage is the same, risk premia should equalize across instruments, reflecting market arbitrage*.[10]

As is well known from conventional risk theory, the benefits of insurance derive from the fact that it allows risk to be broken down into well-defined pieces, thereby allowing for efficiency gains in risk allocation. We certainly do not dispute this point.[11]

Instead, the key point we wish to make is that simply comparing the cost of an insurance contract to the holding cost of reserves is misleading because the effective risk coverage is unlikely to be the same. First, reserves allow a central bank to cover a wider range of adverse events than an insurance to which strict triggering clauses are attached. Second, because an insurance contract needs to be renewed on a periodic basis, the insurer always has the recourse to reduce its exposure once the probability of a bad event is perceived to be rising.[12] It can do this by refusing to renew its insurance, by raising its premium, or by shortening assets whose risk is correlated with the insurance triggering event. By shortening the local currency or public debt instruments, the insurer can increase the pressure on the exchange rate or the sovereign premium, making the crisis more likely.[13]

Third, the cost comparison of insurance and international reserves should also be adjusted for seniority rights. If the insurer acquires a higher seniority status than bond holders, the cost of the insurance premium will decline while bond premia will rise. From the perspective of the central bank (or the country as a whole), the total insurance cost, whether through self-insurance or external insurance, remains the same.[14]

Private insurance

The pitfalls of external insurance – beware, if it is cheap, it probably does not cover much risk – are clearly illustrated in two recent examples of large private insurance arrangements. The closest recent experiment of privately funded liquidity insurance was the contingent credit line subscribed between the Argentinian central bank and a consortium of foreign banks in the late 1990s, whereby the central bank – as well as participating local banks – had the option to engage in a repurchase agreement against Argentinian sovereign securities for up to $6.7 billion (see Box 9.1). However, the coverage of this contract was relatively limited; its execution was delayed until August 2001, when the liquidity run was well under way; and it was executed only in connection with an agreement with the IMF that propped up the price of bonds, albeit momentarily. All in all, the contract ultimately provided a meagre $1.77 billion (out of $4.75 billion available at the beginning of 2001). Moreover, due to the ongoing liquidity run, the decline in the price of the bonds used as collateral implied a reduction in the size of the line, which dropped to $1.35 billion at the first three-month renewal, thus generating a financing gap for the difference – exactly the opposite effect from the one that motivated the contract in the first place.[15]

Box 9.1 The Argentinian contingent credit line

Under this contract, the Central Bank was allowed to withdraw, in the event of a crisis, from a credit line in exchange for dollar-denominated government bonds. The maturity of the contract was three years, with an ever-greening clause such that, every three months, the life of the programme was extended a further three months (the high frequency of this revision clause, while it helped to reduce the commitment fee, ultimately proved to be a severe drawback of the scheme). Argentinian dollar-denominated bonds were taken at 80 per cent of their market value (if the price of the bonds fell by more than 5 per cent, further bonds had to be delivered as margin).

The contract stipulated an annual commitment fee of 32 basis points (bps), plus an interest rate on withdrawn funds of roughly LIBOR plus 205 bps. The insurance cost certainly looked small compared to that of holding reserves (for illustrative purposes, the average government bond yield in 1998, by the time the contract was in place, was around 940 bps). Using the spread over the average return on reserves reported by the Central Bank for the same year as a proxy for the cost of carrying additional reserves, increasing the stock by the amount committed under the contract would have entailed a 'fee' cost of about 570 bps (alternatively, a flow cost of roughly $380 million per year), well above the 32 bps commitment fee under the contract.

A second related experience with this type of private liquidity insurance contract is provided by Mexico (see Box 9.2). The line was withdrawn in its entirety by the Mexican government on 30 September 1998, prompted by a deterioration in access to the international capital markets coupled with a decline in oil prices that reduced fiscal resources. However, as was to be the case later on in Argentina, insuring banks contested the decision of the government to use these resources, on grounds that current external conditions did not warrant the execution of the contract. Although they finally conceded to extend the loan, they subsequently refused to renew the contract. While it is difficult to attribute this controversy to one single cause, a balanced judgment would point to a combination of two factors: the difficulty in defining unambiguously the event that triggers the contingency clause and the reluctance of the insurer to assume the costs of the contract. At any rate, the contract proved to be subject to controversial interpretations that may have detracted from its timeliness and effectiveness.

Thus, the apparent appeal of this type of solution is subject to a major caveat. If an international financial institution appears to be much more inclined to offer insurance than to hold sovereign bonds, this is most likely to reflect the fact that the risks it imputes to the two instruments are quite different. The purchaser of the insurance should thus be aware that the effective cost *per unit of risk* is unlikely to be very different between the two instruments, even after accounting for possible efficiency gains.

A further limitation of external insurance is associated with size. If this type of contract extends to several emerging markets, the scope for the insurer to diversify risks that are highly correlated within the region narrows, hence limiting the size of the coverage. Thus, inasmuch as currency attacks have a common pattern across insured countries, there will be a limit to the coverage that private international institutions may be willing to extend.

Box 9.2 The Mexican contingent credit line

In November 1997, the Mexican government subscribed to a contingent credit line with 31 major private international financial institutions, at a time when the contagion effects from the Asian crisis were starting to be felt in emerging markets. The facility would provide the government with sufficient resources to meet the external debt service in the event of a closure of the country's access to international capital markets. Specifically, it made available $2.5 billion (later extended to $2.66 billion with the addition of two new institutions) for up to eighteen months, at a rate equal to the three-month LIBOR plus 50 bps during the first quarter (increasing by 25 bps each subsequent quarter), at the cost of an annual commitment fee of 30 bps (or, approximately, $7.6 million).

In sum, these two experiences seem to indicate that private insurance, while possibly useful as a partial complement to other mechanisms, is not a magic bullet for countrywide coverage of systemic liquidity risk.[16]

Public insurance

Some of the main drawbacks of private insurance (particularly moral hazard and the need for hedging) can be overcome by contracting insurance from non-profit official organizations (such as IFIs) or other regional financial arrangements (such as the Asian Chiang Mai initiative). In the case of the IMF, while this is an issue that goes beyond the scope of this chapter, it will suffice here to note that IMF-led packages have so far provided liquidity insurance only imperfectly and reluctantly, and with the broader objective of stabilizing the capital account, which goes beyond the more specific one of assisting local banks. Moreover, difficulties in isolating liquidity from solvency concerns have hampered the scope for a smooth and timely provision of liquidity support. Thus, the recent IMF contingent credit line initiative, the closest to a liquidity insurance scheme ever launched by an IFI, required a somewhat discretionary pre-qualification process at the request of the countries. Combined with its limited size, this reduced its potential attractiveness. As a result, it was never requested and was ultimately phased out. Thus, while the role of IFIs as country insurers certainly deserves rigorous consideration, it is questionable whether a country insurance facility of sufficient size could become available in the foreseeable future.

This leaves the country with the self-insurance option as the only fully reliable option. In the case of a liquidity run on the banking sector, this option can take essentially two forms: LARs on dollar deposits, or the accumulation of central bank reserves. To the analysis of these options we now turn.

9.3 The case for liquidity requirements

Background

Reflecting the difficulties of contracting external insurance, most financially dollarized economies – particularly those hit by recent currency runs – have exhibited a preference for self-insuring through large international reserve buffers. This has been the case, irrespective of the exchange regime (see Table 9.1).[17]

Table 9.1 International reserves, various countries (as per cent of GDP)

Country	1992	2002
Algeria	3.0	41.3
Argentina	4.2	10.2
Brazil	5.8	8.1
Bulgaria	10.3	27.9
Chile	19.8	22.0
China, PR: Mainland	4.0	22.5
Colombia	13.2	12.7
Costa Rica	11.7	8.7
Côte d'Ivoire	0.1	15.9
Croatia	1.7	25.8
Ecuador	6.6	2.8
Egypt	25.4	15.4
Hungary	11.6	15.0
India	2.0	13.5
Indonesia	7.3	17.7
Israel	7.7	22.8
Jordan	14.6	42.4
Korea	5.0	22.1
Lebanon	26.3	41.6
Malaysia	28.4	35.0
Mexico	5.1	7.7
Morocco	12.2	27.5
Nigeria	3.4	15.9
Pakistan	1.7	12.6
Panama	7.3	9.5
Peru	7.8	16.6
Philippines	8.1	17.2
Poland	4.6	14.6
Russia	n.a.	12.7
South Africa	0.8	5.3
Thailand	18.3	30.0
Turkey	3.7	14.5
Ukraine	2.3	9.9
Uruguay	3.8	6.2
Venezuela	15.4	8.5
Average EM	**8.9**	**18.1**
Australia	3.5	4.7
Canada	1.6	4.4
New Zealand	7.3	5.5
Norway	8.7	16.1
Switzerland	13.0	13.9
United Kingdom	3.2	2.1
United States	0.6	0.3
Average industrials	**5.4**	**6.7**

Source: Reproduced from Cordella and Levy Yeyati (2005).

The accumulation of international liquidity can take different forms, however, depending on who is the owner of the liquidity. In the traditional (and most frequently encountered) form, the central bank centralizes most of this liquidity by subjecting commercial banks to reserve requirements or by borrowing in the domestic debt market. It administers the use of this liquidity by providing LOLR in domestic currency and intervening in the foreign exchange market to sterilize the excess liquidity, or by providing LOLR directly in foreign currency to banks incurring dollar deposit outflows.[18] However, the need to fend off pressures to use this stock of liquidity for non-intended purposes has motivated, in many countries, the introduction of LARs on financial institutions (as in Argentina under the currency board). In such cases, the contingency fund is raised and directly invested by the banks in a foreign account.

Some first principles

The model presented in Appendix 9.1 discusses the comparative benefits of either approach, illustrating two main, rather intuitive aspects.

The first one highlights the fact that access to a LOLR facility, whether in pesos or in dollars, is a substitute for the banks' own liquidity holdings, thereby reducing banks' demand for precautionary liquidity. In the absence of LOLR, banks demand liquid reserves up to the point where the marginal carrying cost of the reserves equals the marginal cost of falling short of reserves, times the probability of facing such a shortage. By contrast, with a LOLR, banks restrict their demand such that the marginal carrying cost of the reserves equals the marginal cost of borrowing from the LOLR facility, times the probability of falling short. Since in the relevant case, the cost of borrowing must be below the cost of falling short, it follows that banks demand fewer reserves in the presence of a LOLR.[19] Specifically, they restrict the use of their own reserves to the smaller, most likely shocks, and rely on the central bank's LOLR to cover the larger, less likely shocks.

The second aspect stressed by the model is the fundamental asymmetry regarding the cost to the central bank of providing a peso LOLR versus a dollar LOLR. In the first case, the LOLR can be offered at virtually no cost through the issuance of peso monetary liabilities. Indeed, even if the provision of liquidity is fully sterilized, the risk-adjusted rate it receives on its loans would be typically higher than the rate it pays on its bonds, so that a peso LOLR could be regarded as a profitable activity. More important, it is also socially desirable because it makes banks more resilient to runs, hence less exposed to costly liquidations.[20] Instead, a peso central bank can only provide dollar LOLR to the extent that it holds dollar reserves. However, the carrying cost of dollar reserves exceeds the expected revenue from their use in LOLR. Indeed, should this not be the case, commercial banks would be better off holding their own reserves rather than borrowing them (at a penalty rate) from the central bank. Thus, a dollar LOLR is costly to a central bank.[21] At the same time, what constitutes a cost to the central bank becomes a subsidy for commercial banks – at the expense of the representative taxpayer. Thus, the dollar LOLR limits the risk of dollar deposits and lowers their cost, thereby *promoting excessive dollar intermediation*.

A corollary of the model is that, in much the same way as any other unfairly priced insurance scheme, the dollar LOLR facility subsidizes – in addition to currency risk – risk-taking in general. When assessing the opportunity cost of liquidity, banks only consider the favourable states of the world in which they remain solvent, reflecting limited liability. Thus, more aggressive banks will compare the returns on loans in the event loans are repaid and the bank remains solvent (which incorporate a higher risk premium) to the return on liquid reserves (which earns a zero premium). They will therefore hold less precautionary reserves and rely more on the LOLR facility.

On the other hand, if central bank reserves are limited and rationed among all banks, conservative banks will increase their reserve holdings to avoid being rationed. It follows that, the central bank's reserves, when binding, will largely be used to support risky banks. In turn, by holding fewer reserves, risky banks will face lower intermediation costs than conservative banks and, hence, will be able to compete unfairly with conservative banks. Thus, a reliable dollar LOLR funded in a large stock of liquid reserves at the central bank may lead to a more risky banking sector.

Policy implications

Eliminating the provision of dollar LOLR under *systemic liquidity crises* would thus be desirable in that it would reduce the scope for distortions and induce banks to demand levels of dollar liquidity that are closer to the optimum. However, a dollar LOLR plays a useful role in resolving *idiosyncratic liquidity crises* and limiting contagion risk. Due to the central bank's privileged position (seniority status in liquidation claims and privileged information on the banks' financial situation) and its capacity to overcome coordination failures (in cases where it is optimal for the banking system as a whole to support a bank in difficulty but no bank can do it in isolation), a central bank LOLR that recycles dollar liquidity from liquidity-rich banks to liquidity-poor banks can improve on the functioning of the interbank market.[22] At the same time, by pooling reserves centrally and recycling liquidity, a dollar LOLR can greatly economize on (or obviate altogether) the need for international reserves. Thus, it enhances the capacity of individual banks to sustain a particularly large run on their deposits, thereby limiting contagion risks and increasing the resiliency of the banking system as a whole.

The distortionary impact of a dollar LOLR on the demand for bank reserves could be limited in principle by ensuring that its use is strictly restricted to idiosyncratic events. However, differentiating between purely idiosyncratic events and systemic runs is likely to be difficult (if not impossible) in practice. With contagion risk, idiosyncratic events can trigger systemic crises. At the same time, systemic factors can manifest themselves first in one or two banks.

Since a dollar LOLR facility serves a useful role and its use cannot be credibly restricted, the preferable second-best policy is to require that all banks hold minimum liquid dollar reserves in proportion to their liquid dollar liabilities. Introducing LAR will ensure that: (i) banks do not 'free-ride' on the central bank's LOLR and international reserves, thereby shifting the cost of the liquidity buffer to

the public sector and undermining the central bank's solvency; and (ii) weaker (or riskier) banks do not unduly benefit from the LOLR facility at the expense of the stronger, less risky banks, thereby making the financial system more brittle and vulnerable.

The LARs should be set such that they induce banks to hold *socially* optimal levels of liquidity. When liquidation costs are fully internalized by banks, the optimal LAR should match the liquidity levels banks would choose on their own in the absence of an LOLR facility. However, in the presence of externalities (due to contagion risks or liquidation costs that banks do not internalize), the LAR may need to be higher. To avoid any shift in the burden of the liquidity buffer to the public sector, the assets eligible for the LAR should be restricted to foreign assets that benefit from a deep, liquid market.

Once LARs are introduced, the central banks' dollar LOLR can be credibly limited to providing exceptional additional support to isolated banks that face very large liquidity shocks. Official international reserves to support such operations are only needed to the extent that central bank obligations to the banks supplying the liquidity may need to be partially backed by foreign reserves, particularly if they have a very short maturity.[23]

9.4 Should circuit breakers be institutionalized?

What are circuit breakers?

Given the cost of insurance (whether self-contracted or externally contracted), it is generally not optimal (or feasible) to fully back all deposits with liquid foreign assets. This raises the question of how to deal with too large (therefore, not optimally insurable) dollar liquidity runs. In this section we examine a novel mechanism that could complement LARs. What we have in mind is a scheme that limits in an organized and predictable way the convertibility of dollar deposits in the event of a pronounced run. As the scheme is intended to short-circuit the run at an early stage, we refer to it as a CBR.

To date, governments have been reluctant to introduce CBRs during 'tranquil' times, as part of the 'standard' prudential regulatory framework, partly out of concern that they could 'scare away' depositors, thereby reducing the overall level of financial intermediation. However, there are some historical precedents for the use of CBRs during the free banking era that suggest they were well accepted by the public and ended up serving a useful purpose (see Box 9.3). Chile provides a more recent illustration of a bank resolution mechanism which is rather similar to a CBR and which has been in place since after the 1982 banking crisis (see Box 9.4). Although admittedly aimed at idiosyncratic risk rather than systemic risk, and so far untested, this mechanism has not given rise to any substantial concern by banks' customers.

Indeed, one can also make a parallel between the attitude of emerging market countries about the use of CBRs in the banking system and the adoption of collective action clauses (CACs) in sovereign debt markets. Until recently, most countries were reluctant to include the CAC in their legal documents because they

Box 9.3 CBRs and suspension of convertibility in the free banking era

The notion of CBRs resembles the suspension of convertibility (an option clause) that was included in bank contracts in Scotland and other European countries during the free banking era (in the 18th and 19th centuries), and in the USA during the national banking period (1863–1914).

The option clause in Europe was introduced at a time when commercial banks issued most of the currency and notes in circulation, and when these notes could be redeemed at par for hard currency. The clause was designed to allow banks to 'defer the redemption of their notes provided they pay interest for the period of deferment' (Shah, 1997). In addition in the notes there was a printed statement that promised to pay a higher interest rate for the period of deferment.

There is little evidence regarding how widely the option clause was used in practice and about its effectiveness. Nevertheless, Shah (1997) states that the Bank of Scotland introduced an option clause in 1730 in its notes and that it remained in place until 1765, when it was outlawed.

The other useful experience was when, on occasion, convertibility of notes was suspended in the USA since the Civil War. Calomiris and Gorton (1991) describe seven major episodes when there was a suspension of convertibility of notes (1873, 1893, 1907 and 1914) during the national banking era. The suspension of convertibility was perceived as an effective way to deal with bank panics, as it minimized the cost to depositors and avoided a large number of bank failures. Calomiris and Gorton estimate that the worst loss to depositors during the national banking era was 2.1 cents per dollar of deposits, while the worst case in terms of banks failing was 1.28 per cent during the panic of 1893 (p. 114).

Dwyer and Hasan (1999) provide additional evidence in favour of using some form of CBR. They compare the impact of the 1861 bank panic in Wisconsin and Illinois and find that while 87 per cent of banks in Illinois finally closed, around 44 per cent of the banks closed in Wisconsin. They argue that the introduction of the suspension of payments in Wisconsin is the main reason that explains the better performance of the banks in Wisconsin during the panic. In addition, they provide evidence indicating that the suspension of payments decreased noteholders' losses by about 20 per cent.

feared that investors would react negatively and would require a higher interest rate on their bonds if they were issued with a clause that would make it easier for the country to restructure the debt. However, recent emerging market issues including CACs (e.g., Mexico, Brazil, or Uruguay) were not visibly penalized by the markets, suggesting that the concerns that countries had about including the clause in the bonds may have been largely unjustified. There are reasons to expect that something similar may occur with the introduction of CBRs.

Why do CBRs make sense?

In most of the recent systemic bank panics in dollarized Latin American economies, governments were forced to take forceful measures at some stage to stop the runs. Ecuador, Argentina and Uruguay are just three recent examples of dollarized economies where such measures became mechanisms of last resort. They represented desperate attempts to avoid a full collapse of the banking system and were designed in a rush in the midst of a crisis. In some cases, they took the

Box 9.4 A more recent example of pre-programmed CBR: the Chilean 'narrow bank' safety net

Sight deposits (and term deposits of less than 30 days or whose term to maturity is less than ten days) are fully guaranteed by the Central Bank of Chile (BCC), which protects itself from potential losses by requiring that banks hold liquid assets (in the form of Central Bank debt) against sight deposits in excess of 2.5 times their capital. In addition, if the guarantee were triggered, the BCC would become the most senior claimant on the bank's assets.

When a bank is unable to meet its commitments (including as regards its liquid asset requirement) or severe solvency or managerial shortfalls emerge (as defined in the banking law), the bank's non-sight liabilities are frozen while sight deposits remain fully accessible; they are 'decoupled' from the rest of the bank together with the corresponding liquid assets plus the BCC guarantee. This protects the payments system, mitigates the contagion risk of a bank closure and provides breathing space for an efficient resolution of the non-narrow part of the bank.

The risk of an unwarranted, last-minute expansion of the guarantee is limited by a five-day advance notice required by banks for transferring term deposits into sight deposits. The bank resolution system is conditioned to (and shaped by) a creditor agreement ratified by the majority (in terms of claims) of the bank's non-sight creditors (and the Superintendency of Banks and Financial Institutions). When an agreement cannot be reached, outright liquidation on the entire non-narrow bank is the only possible outcome.

Source: Chile FSSA.

form of a freeze on part or all of the deposits in the banking system, in others a forced restructuring of time deposits. In a few cases, a 'corralito' was created, which meant that depositors maintained access to their funds but only if they remained in the (local) banking system (see Box 9.5).[24]

However such measures (which were also in the nature of CBRs) were typically brought in at a late stage of the crisis and their design was largely improvised in the spur of the moment. Thus, their introduction implied a significant change in the rules of the game (including legally sanctioned contractual clauses) as they were not part of the regulatory framework at the time of the crises. As a result, these measures typically created large uncertainties at the time of their introduction, compounding those already inherent to the crisis. In addition, they gave rise in the months and years after the crisis to endless litigation, forcing some of these measures eventually to be reversed in the courts or resulting in costly fiscal outlays to settle the claims.

Instead, a CBR could be made an integral part of the regulatory framework and tied in with bank resolution procedures. The explicit adoption of a system of CBRs that are clearly pre-specified has a number of important advantages. First, it helps depositors know the rules of the game in advance, and limits the scope for ex post legal action against abuses on property rights. Second, if the CBRs are well designed and accompanied by appropriate LARs, they can reduce the social cost of a crisis by limiting firesales and ensuring that the payment system continues to function, banks remain open and scarce dollar liquidity is allocated to its best use.

Box 9.5 The Argentinian 'corralito'

In deposit freezes, depositors lost access to the deposits included in the freeze and did not know how and when they would regain access (no clear mechanism or date were provided in that regard). Nor did depositors know the interest rate earned by the frozen deposits during the freeze. In most cases, the freeze was introduced as a temporary measure until a longer-term solution could be found.

Compulsory reprogrammings of selected deposits provided a preferable alternative in that depositors receive a new financial instrument from the bank with a known maturity, which could be securitized as a certificate of deposit or medium-term note, to be traded in the secondary and repo markets increasing its liquidity for cash-strapped depositors. However, the difference between the two is ultimately moot: if the conditions that led to the freeze are not reverted in the short run, it should eventually evolve into a full reprogramming.

The Argentinian 'corralito' (or fence) in principle had the advantage that it allowed depositors to maintain full access to their funds as long as they remained within the (local) banking system. Agents could issue cheques and transfer funds between bank accounts, from one bank to another, from peso to dollars, and from time to sight deposits. However, they could not withdraw cash and their transfers abroad were restricted to commercial account transactions (capital controls were introduced).

The 'corralito', however, had a number of crucial drawbacks. First, it did not prevent the further dollarization of bank deposits (as agents anticipated a large devaluation). This deepened banks' currency mismatch, as banks were unable to adjust the currency denomination of their loans. In addition, it worsened flight to quality, as nothing prevented runs on the weakest individual banks. The Central Bank was therefore pressed into providing extensive lending of last resort. Individual bank failures happened in any event, thereby reinforcing the panic.

In addition, and most important, the 'corralito' failed to shield the real side of the economy from the crisis. It ultimately affected the payments system, as a large part of the transactions were conducted in cash, which agents started to hoard and therefore became increasingly scarce. Figure 9.1 illustrates this point, showing the price of liquidity in Argentina 2002, as measured by the cash discount of cheques in the informal market. This problem was compounded by the fact that, because the 'corralito' allowed depositors to shift across currency and deposit type, it defeated the objective of isolating typically stable transactional peso deposits from declining dollar saving deposits.

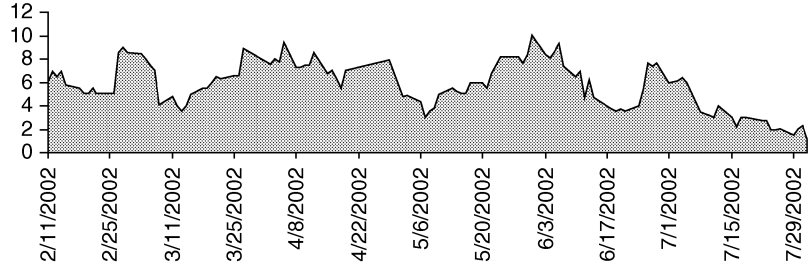

Figure 9.1 Liquidity premium (in per cent)

Source: Central Bank of Argentina.

For a *given volume of systemic liquidity* and fully informed and rational depositors, there is no reason why CBRs should make the system more fragile (i.e., increase its exposure to systemic liquidity crises). This is obvious if the run is triggered by fundamentals (i.e., by expectations of bank insolvency that are independent of the run) since in this case the run will occur no matter what. In the case of purely self-fulfilling runs, on the other hand, CBRs are more likely to *reduce* the likelihood of runs than to increase them. Indeed, it is reasonable to expect that the likelihood of a self-fulfilling run should increase with the losses incurred by residual depositors and decline as the volume of liquidity available to counter the run increases.[25] Thus, to the extent that pre-programmed CBRs permit more orderly and predictable banking arrangements to be put in place, they should help protect the value of bank assets, thereby limiting losses to depositors. Hence, CBRs should limit incentives for running and contribute instead to a more stable banking environment – much in the same way as collective action clauses are viewed by their advocates as a way of reducing the sunk cost of protracted debt crises.

Two important caveats apply, however. First, by reducing the cost to banks of failing to meet deposit withdrawals (i.e., by avoiding firesales of assets), CBRs should also reduce the marginal benefit of holding reserves, hence banks' voluntary demand for liquid reserves. Thus, unless binding LARs are imposed, the reduction in systemic liquidity resulting from the introduction of CBRs could make the banking system more fragile. CBRs should thus be viewed as an *addition* to a LAR system, rather than a *substitute*.

Second, the introduction of CBRs in a context in which depositors are not all well-informed and rational could generate some turbulence, depending how it is perceived. *Poorly informed depositors* could interpret it as an indication that liquidity crises may become more likely in the future. If so, the resulting increase in depositor nervousness could make self-fulfilling runs more likely. It is thus important that the CBR system be introduced in a non-threatening way, that does not *raise more questions than answers*. This may be achieved by putting the emphasis on deposit protection instead of deposit restructurings. The narrow bank deposit protection scheme proposed below can indeed be presented in this light.

Where to build the flood gates?

There are three main ways to 'quarantine' deposits in a way that protects the liquidity of the banking system. Deposits can be segregated *by physical location, by currency of denomination, or by type*. In the first case (separation by physical location), the local banking system is cut off from the foreign banking system and payments in cash are rationed, much as in the Argentinian 'corralito' system. The second case (separation by currency), in which the dollar component of the banking system is cordoned off from the peso component, is equivalent to forcing dollar transactions through offshore subsidiaries of local banks. In the third case, the transactions component of the banking system is delinked from its term deposits component, as in the Chilean 'narrow bank' resolution framework. We argue that this third option is the preferred one.

The 'corralito' system has, in principle, the benefit that it does not constrain domestic transactions or banking activity. As long as liquidity is not transferred abroad or paid in cash, it remains in the system. In practice, however, 'corralitos' can encourage further deposit dollarization, increasing banks' direct currency exposure (see Box 9.5). In addition, they can induce flight to quality, as depositors can transfer their accounts to the sounder banks in the system. Ultimately, the failure of the weaker banks can thus further destabilize the banking system as a whole. Moreover, the prohibition of making payments in cash can encourage cash hoarding, thereby affecting the payments system. Finally, the 'corralito' system requires introducing capital controls, which are expensive to administer and will unavoidably start to leak, probably sooner rather than later.

Separating the dollars from the pesos, whether through offshorization or domestic Chinese walls, also has severe drawbacks. By protecting peso intermediation and peso payments, this could ensure that a minimum banking activity subsists no matter what. In addition, the application of a distinct regulatory framework to dollar intermediation can help internalize the risk of dollar deposits and penalize their use. However, risks are likely to permeate from dollars to pesos and vice versa. As soon as a bank ceases payments on its dollar deposits (or in anticipation of such an event), peso depositors are likely to run on the pesos. Such a threat is likely to induce the bank to borrow in pesos from the central bank in order to protect its dollar operations. While the threat is less direct when the dollar intermediation is carried out by a separate offshore subsidiary of the local bank, it is not less real. As illustrated by the recent Ecuadorian experience, runs on offshore subsidiaries can spread very quickly to the onshore banks.[26]

In any event, as local banks convert pesos into dollars to pay off dollar depositors, or else pay them in pesos, the injection of pesos in a dollarized economy (in which depositors want dollars, not pesos) will pressure the central bank's foreign reserves. Once the central bank lets go of the exchange rate, the resulting depreciation will affect the debt-servicing capacity of debtors that borrow in a mix of currencies, thereby undermining the quality of both dollar and peso loans. Thus, currency-induced credit risk is likely to spread to the peso bank, exposing it to risks of insolvency, even when it has its own separate capital. As the dollar can ultimately carry the peso with it into the abyss, limiting CBRs to dollars is therefore unlikely to stabilize the peso deposits.

Consider finally the narrow bank alternative. Its aim is to maintain unfettered access to transaction deposits (chequing and savings accounts) while restricting access to the most liquid savings instruments, such as time deposits, which can be withdrawn at short notice. In countries where the payments system is highly dollarized, this would require that access to both dollar and peso sight deposits be guaranteed. Banks should therefore hold enough liquid dollar assets to fully back their dollar sight deposits.[27] Although not perfect (some of the time deposits might be a temporary store of value for large transactional balances), this option minimizes the impact on the payment system. The need to fully back dollar sight deposits might have some welfare cost in terms of additional liquidity requirements. However, this cost is likely to be limited relative to the cost of having to

introduce CBRs ex post under a crisis situation. The fact that the narrow bank option does not have to be applied uniformly to all banks, as explained below, further enhances its attractiveness.

How should the CBRs be activated?

There are two key policy issues as regards the activation of the CBRs: (i) should they be activated centrally (on the basis of the overall liquidity of the banking system) or should they be based on bank-specific liquidity indicators? and (ii) should they be activated automatically or should they be subjected to discretionary approval from the supervisor?

Having a purely systemic trigger that sets off when systemic liquidity hits a certain threshold and applies to all banks has the advantage that it brings the run to an early halt across the board. However, it has crucial shortcomings. First, it is imposed on banks that might not need the CBR, because they have enough liquidity or have access to funding from abroad, through their parents or through market arrangements. This can introduce perverse incentives: it penalizes the more conservative local banks that manage their liquidity better, and erases the natural competitive advantage in dollarized environments of the large, reputable international banks (giving them instead the legal and 'market' backing – hence the option – to shy away from their losses and leave the country in the event of a crisis).[28]

Second, in the absence of a verifiable indicator of the systemic nature of the run, a one-size-fits-all solution is bound to be questionable on legal grounds. This defeats one of the key goals of the CBR system, namely, the limitation of the fiscal losses associated with a run, because of litigation costs that inhibit timely action in the context of a crisis, or burden taxpayers once the crisis is behind. In sum, a decentralized, bank-by-bank trigger is clearly preferable.

As regards the timing of the trigger, allowing the supervisor some discretion is also problematic. In particular, supervisors might be reluctant to trigger the CBRs for any particular bank on the grounds that doing so might expand the run to other banks. Indeed, once the CBR is activated in one bank, risks of contagion and domino effects could increase.[29] Moreover, allowing for discretion would enhance the scope for ex post battles in the courts – and, for the same reason, ex ante hesitation.

Thus, the CBR should preferably be automatic and fully determined by market forces, in the form of transparent, legally uncontestable criteria. A natural mechanism would entail linking the trigger to the failure of the bank to satisfy a *minimum LAR* on time deposits (below the normal LAR) or to ensure that sight deposits remain fully backed. As time deposits leave the bank, or move to sight deposits to elude the CBR in anticipation of a run, the stock of liquid assets associated with time deposits will start to decline while those required to back the increasing sight deposits will start to rise. At the beginning, the bank may be able to cushion the liquidity shortage by using excess liquidity elsewhere or borrowing from the market. Ultimately, however, its liquidity will fall below minimum required levels and the bank will be forced to introduce the CBR.

A bank that fails to meet its minimum liquidity requirements will incur an automatic excision in which transaction deposits remain fully accessible while the convertibility of time deposits into cash or sight deposits is temporarily halted. As long as the bank meets its other prudential requirements (particularly solvency requirements), it would continue to be managed by its owner. It would re-open normally for business once it meets again its normal LAR. If the bank is unable to do so under a maximum time period set by the supervisor in view of systemic conditions, it would be liquidated.[30]

9.5 Conclusions

This chapter tackled a question that clearly has important policy implications but has received little attention in academic circles: how should scarce dollar systemic liquidity be managed in a highly dollarized environment? The chapter looked at three interrelated facets of this issue: (i) Should liquidity be held or can it be borrowed? (ii) When held, should it be centralized or decentralized (e.g., held by the central bank or by individual commercial banks)? (iii) When demands on this liquidity become excessive, should the CBRs used to stop the run be pre-wired instead of improvised?

The discussion drew a number of relevant – albeit preliminary – conclusions:

1. The current menu of liquidity insurance options is mostly limited to forms of self-insurance (e.g., holding your own liquidity). While market-based insurance may look appealing at first sight, a correct comparison of costs that adjusts for risk coverage greatly reduces its attractiveness. While official insurance could be relatively more attractive, getting the right combination of size, cost and guaranteed access seems to be beyond what IFIs can presently offer.
2. Given the need for self-insurance, accumulating reserves centrally induces moral hazard as banks, particularly weaker ones, free-ride on the central bank and hold a suboptimally low level of dollar liquidity. In addition to penalizing the more conservative banks, centralized reserve holdings end up subsidizing the dollar at the expense of the peso.
3. Decentralized LARs are thus generally preferable. Once introduced, however, the central bank may wish to also maintain some international reserves and a dollar LOLR capacity to further limit the scope for runs on individual banks.
4. The negative impact of disorderly bank closures on the payments system and on the value of bank assets, and the adverse legal and fiscal implications of forced deposit restructurings, can be avoided with pre-wired CBRs that automatically suspend the convertibility of time deposits while ensuring continued access to sight deposits.
5. However, to be successful (e.g., to be politically acceptable and to be perceived as stabilizing rather than destabilizing), CBRs should be accompanied by LARs and preferably embedded into a *deposit protection* legislation aimed at guaranteeing the liquidity of sight deposits and avoiding unnecessary bank liquidations.

Appendix 9.1 A model of LOLR and bank demand for dollar liquidity

The basic setting

Suppose there are dollar banks offering dollar deposits and investing in dollar loans or dollar reserves abroad, and peso banks offering peso deposits and investing in peso loans or peso central bank bonds. To begin with, suppose all dollar banks and all peso banks have identical assets and risk preferences.

In deciding how much liquidity to hold, dollar banks compare the carrying cost of their liquidity to the cost associated with being unable to meet the demand for deposit withdrawals. The carrying cost of dollar liquidity equals the spread $s_D = r_D - r_D^*$ where r_D is the (risk-free) local dollar lending rate, and r_D^* is the world rate of return on liquid dollar assets. Similarly for peso banks, the carrying cost of liquidity is the spread $s_P = r_P - r_P^*$ where r_P is the (risk-free) peso lending rate and r_P^* is the yield of central bank peso bonds. Assuming interest rate parity, $r_D = r_P$, and a positive country and currency premium, $\varphi = r_P^* - r_D^* > 0$, it follows that: $s_D - s_P = r_P^* - r_D^* = \varphi$.

Let $P(x)$ be the cumulative probability of facing a *systemic* deposit run (uniform over all banks and currencies) of up to size x, where $x \in [0,1]$ is the proportion of the bank's deposits. $P(x)$ is assumed to be monotonically increasing and convex over the range [0,1], so that $P'(x) < 0$ over the range (runs of size x become less and less likely as x increases). For simplicity, we assume $P(x)$ exogenous and identical for peso and dollar banks. The cost of falling short of liquidity is the loss of value resulting from the firesale of loans, which is defined (per value of loan) as μ, and is assumed to be the same for peso and dollar loans.

The case of no LOLR

In the absence of a LOLR, banks hold liquid reserves, l, such that they can meet deposit withdrawals up to the point where the carrying cost of a marginal unit of reserves equals the expected benefit of being able to meet the marginal demand for deposits (thereby avoiding the marginal cost of firesales). Thus:

$$s_i = \mu P'(l_i), i = P,D \tag{3}$$

or:

$$l_i = P'^{-1}\left(\frac{s_i}{\mu}\right), \; i = P,D \tag{4}$$

where, in view of the convexity of P, $\partial P'^{-1}(u)/\partial u < 0$.

The case with LOLR

To ensure that the LOLR is only used as a last resort, its rate must be a penalty rate $R_i = r_i + \sigma_i$, where $\sigma_i > 0$, $i = P, D$. At the same time, for the facility to be used: $R_i < \mu$. If access to LOLR is unlimited (i.e., as long as the stock of official reserves is not binding), banks will limit their demand for liquidity such that the carrying cost of the marginal reserve equals the expected cost of accessing the LOLR facility:

$$s_i = R_i P'(\hat{l}_i) \tag{5}$$

so that the demand for bank reserves now becomes:

$$\hat{l}_i = P'^{-1}\left(\frac{S_i}{R_i}\right) \tag{6}$$

Since $R_i < \mu$, banks' demand for liquid reserves is now lower ($\hat{l}_i < l_i$) and rises with R_i. Provided the cost of using the LOLR facility is sufficiently high, $R_i > s_i / P'(0)$, it pays for

banks to keep a minimum cushion of reserves to accommodate deposit withdrawals within a limited range where runs are more likely. For larger, less likely runs, banks are better off counting on the central bank to bail them out.

In the case of a dollar LOLR, the carrying cost of reserves should equal s_D, as before. Yet, the expected revenues from holding a marginal unit of official reserves are $R_D P'(x)$ for $x \in [\hat{l}_D, \hat{l}_D + N]$. From (5), it is clear that: $s_D > R_D P'(x)$ in that range. Thus, the central bank will be making losses.

Differentiated banks

Suppose there are two types of dollar banks. Conservative banks invest in riskless projects. Aggressive banks invest in risky projects that have a probability $p > 0$ of not being repaid. If loans are not repaid, banks become insolvent. If s_D^a and s_D^c are the spreads faced by aggressive banks and conservative banks, market arbitrage should ensure that expected profits equalize across banks, hence:

$$(1 - p)s_D^a = s_D^c \tag{7}$$

Aggressive banks' demand for precautionary liquidity will be such that the marginal cost of carrying the liquidity equals the marginal benefit of reducing the likelihood of firesales, both being conditional on the bank remaining solvent:

$$s_D^a = R_I P'(l_D^a) \tag{8}$$

A similar expression applies to conservative banks. Since $s_D^a > s_D^c$, $l_D^a < l_D^c$ i.e., aggressive banks hold fewer reserves than conservative banks. Hence, they will make a disproportionate use of the LOLR facility.

In turn, if central bank reserves are limited and rationed among all banks, conservative banks will increase their reserve holdings to avoid being rationed. Thus, for $x \in [\hat{l}_D^a, l_D^c]$, the central bank's reserves, when binding, will only be used to support risky banks.

Notes

1. The authors would like to thank Julio de Brun, Philip Turner and the participants at the April 2005 Lima conference for their comments.
2. While recent deposit runs in highly dollarized countries have affected both peso and dollar deposits, the magnitude of dollar runs was substantially larger (both in absolute magnitude and as a proportion of initial deposits), reflecting in part the fact that peso deposits are largely transactional (see Gulde *et al.*, 2004; Ingves and Moretti, 2003).
3. Such events are scarcely new. The Argentinian crisis was itself to a large extent a repeat of the much earlier but quite similar 'mex-dollar' crisis in Mexico (see Ize and Ortiz, 1987).
4. The notion that self-fulfilling liquidity runs are the main drivers of systemic financial crises has gained advocates in academic and policy quarters. According to this view, increases in perceived rollover risk that trigger interest rate hikes or outright rationing in capital markets may precipitate a default – even in the absence of solvency problems. This multiple-equilibrium argument, rooted in Diamond and Dybvig's (1983) model of self-fulfilling bank runs, has been highlighted for the case of sovereign debt by Calvo (1988) and, more recently, Cole and Kehoe (1996).
5. The link between currency and banking crises has been analyzed, among many others, by Goldfajn and Valdés (1997) and Chang and Velasco (1998), and documented empirically by Kaminski and Reinhart (1999).
6. See Levy Yeyati, Martínez Pería and Schmukler (2004).
7. Indeed, the very presence of dollar liquidity in the banking sector may fuel the run, much in the same way stressed by Zettelmeyer (2000) for capital outflows in the presence of (inadequately small) international rescue packages.

8. The concept has obvious similarities with the definition of a standard insurance contract, under which the insurer promises to *transfer* to the insured party, contingent on the realization of a well-defined event, a pre-specified amount, typically proportional with the losses associated with the event. Indeed, liquidity insurance can be understood as interest rate insurance, whereby the insurer promises to *lend* at a pre-specified rate.
9. In fact, the inverse argument could be made that bond markets should generally be more liquid, hence less expensive, than insurance markets.
10. Note that the length of time during which the central bank is insured plays no role in this argument. Hence, the reasoning that reserves are more costly because they need to be held 'at all times' is fallacious. What matters is the risk of a bad event occurring, *per unit of time*, which is independent of the insurance arrangement.
11. There might also be differences between self-insurance and external insurance contracts as regards their exposure to moral hazard. But note that moral hazard could tilt the balance in favour of either instrument. The fact that the insurable event (i.e., a liquidity run) and the associated losses (i.e., the decline in the value of the banks' assets) are hard to define in a verifiable way provides fertile grounds for moral hazard in the case of an external insurance, thereby raising insurance premia. But moral hazard can also expose central banks to using large reserve holdings in socially suboptimal ways, thereby raising bond premia.
12. A renewable insurance contract that is frequently renegotiated faces the same pitfalls as a bond issue with short maturity. Both are cheap because they provide the acquirer with an exit option in the event of an incoming adverse event. It also follows that a proper comparison of relative contract costs requires an adjustment for rollover frequency.
13. On this, see Broda and Levy Yeyati (2003a). Note that individual institutions, by hedging, would increase their exposure through the insurance policy. However, they are likely to do so to the extent that the negative impact of reducing their position on the country is diluted in the aggregate, while the benefits of hedging accrue entirely to them. In addition, the margin call should also add to this negative feedback effect.
14. The argument could also be made that an external insurance should be less expensive than holding liquidity when runs are purely self-fulfilling. Indeed, a perfectly insured country should be immune to a non-fundamental liquidity run. Thus, an external insurer facing zero risk could offer full insurance (namely, a contract providing the threshold level of reserves as needed) at zero cost. This argument is made by Cordella and Levy Yeyati (2005) to propose that IFIs provide an uncontingent country insurance facility to cope with non-fundamental, self-fulfilling liquidity runs. It has to be noted, however, that if all risk were non-fundamental, a sufficiently large stock of reserves would similarly eliminate risk, hence reduce the cost of carrying reserves to zero.
15. Many reasons prevented the issuance of additional collateral at the time. Besides budgetary constraints on the amount of debt to be issued, there were legal restrictions as the covenants stated in some detail the bonds that could be included in the deal, and many of those could not be reopened. More important, issuing bonds in private markets was not an option in the middle of the run – the very reason why liquidity insurance was needed. One alternative would have been to endow the central bank with additional bonds at the time of negotiating the agreement with the banks.
16. There have also been recent proposals to use non-emerging market-specific assets, such as options on the Standard & Poor's volatility index, as a hedge against sudden stop-induced liquidity crises (see Caballero and Panageas, 2005). However, it is questionable whether the depth of such markets is sufficient to provide broad-based insurance at accessible prices. Moreover, even if there is a broad correlation between world volatility indices and the probability of bank runs in emerging countries, the timeliness of the hedge (a crucial condition for its effectiveness) cannot be ensured.
17. Emerging economies are defined as those included in J.P. Morgan's EMBI Global portfolio. Interestingly, the tendency to increase the stock of reserves applies also to economies with non-dollarized banking sectors (e.g., South East Asian countries), as they still have

a sizable stock of foreign currency liabilities that may impinge on the repayment capacity of the public or corporate sector in the event of a sudden devaluation.

18. A minor variation on the same idea is a fiscally budgeted contingency fund (as in Hong Kong) by which the government (as opposed to the central bank) can act as a LOLR.
19. Note that, if the borrowing cost exceeds the cost of the shortage (associated, for example, to the firesale of assets), banks would never use the LOLR facility, which would therefore become irrelevant.
20. The central bank intermediates between depositors and banks following a general loss of confidence in the same way it steps into the interbank market to intermediate between banks when a particular bank cannot mobilize sufficient financing from other banks due to exposure limits.
21. Unless the central bank can immediately 'fiscalize' this cost by shifting it to the treasury, this may undermine its capacity to conduct monetary policy. See Ize (2005).
22. See Freixas, Parigi, and Rochet (2003) for a recent review of the theoretical justification behind central bank LOLR.
23. If there is a market for short-term dollar treasury bills, the liquidity of that market may also need to be supported by a minimum backing of international reserves that allows the central bank to conduct repo operations against such instruments. However, the interest rate on these instruments should be allowed to rise under systemic crises, thereby limiting their liquidity and contributing to an interest rate defence by inducing other dollar rates (including on bank deposits) to rise.
24. Some of the issues in this section are also discussed in Ingves and Moretti (2003) and Gulde *et al.* (2004).
25. The priors of a deposit run culminating in a banking crisis (i.e., a failure by banks to meet deposit withdrawals) are likely to be inversely related to the available systemic liquidity. On the other hand, for a given prior, a depositor will decide whether to run by comparing his expected costs to his expected gains if he stays put. Thus, lower losses should increase the range of priors for which he will decide not to run. Clearly, a well-capitalized banking system and an efficient banking resolution framework will also be better able to limit potential losses to depositors, thereby contributing to limit the risk of bank runs.
26. Moreover, sending the dollar intermediation offshore has further disadvantages in that it undermines the scope and quality of supervision, thereby increasing the fragility of the banking system.
27. Instead, reflecting the availability of peso LOLR, peso sight deposits may require only partial backing. As in the Chilean narrow bank scheme, the central bank guarantee can be backed by preferential claims on the residual value of the bank – which in practice amounts to granting seniority status to transaction deposits.
28. In the case of branches of foreign banks, the legal backing of the branches' deposits by the parent institution is immediately made null and void by a forceful reprogramming of deposits.
29. The triggering of a CBR in one bank, in a context of 'systemic nervousness', could quickly lead to a segmentation of all other banks into two groups: those that have the support (and credibility) to continue doing business as usual, and those that do not.
30. A good case can be made for fully 'de-coupling' the peso and dollar components of the bank's balance sheet under the liquidation scheme. By ensuring that losses on dollar loans are borne by dollar depositors exclusively, this would help internalize risks and reduce incentives for dollarization. See Broda and Levy Yeyati (2003b).

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Comments on Part III

Philip Turner

The organizers are to be congratulated on bringing together three analyses which go to the heart of the prudential challenges raised by dollarization.

Chapter 7, by de Brun and Licandro, is a fascinating account of the Uruguay crisis. The interaction between exchange rate collapse, bank solvency and public debt is particularly well presented. This crisis, and many others too, demonstrates that the existence of a long-term market for government debt denominated in local currency makes it easier to contain a banking crisis. With such a market, the public would know that the government has the capacity to make good the banks' obligations, and this reduces the risk of a run on the banking system. Moreover, any flight from bank deposits that does take place would not necessarily translate into a flight of capital from the country. The cost of servicing government debt would rise of course (as expectations of currency depreciation would drive down the value of local currency bonds) and the fiscal costs could be heavy, but outright default by the banking system could be avoided.

The two other chapters deal with two key aspects of prudential oversight under dollarization:

- *Credit risk*. The simplest diagnostic of credit risk (debt service to income) is undermined in a highly dollarized economy because dollar debt service is lower than local currency debt service. In addition, the value of local currency collateral can be eroded by large exchange rate changes – which is often just when the collateral is really needed.
- *Liquidity risk*. It is harder to borrow foreign currency than domestic currency in the event of a crisis.

Chapter 8 reviews various measures taken by supervisors in seventeen countries to address credit risk from mismatches of the borrowers (as distinct from those of the bank). The chapter represents a very thorough analysis of how supervisory tools could be used to address currency mismatches. It deserves to be widely read. One might quibble with some of the specific suggestions (e.g., differential capital requirements for business in different currencies). But the central message that better risk management practices and more 'currency-mismatch aware' supervision

are both needed is surely right. Their finding that only a few dollarized countries have adopted measures to control the credit risks stemming from borrowers' currency mismatches shows that more effective supervisory action is still needed.

The framework proposed by Basel II is better suited to this task than was Basel I. One key aim of Basel II is to encourage banks to develop a *quantitative risk management culture*. Risk assessment is based on default probabilities that are derived from actual history. If, for instance, the default probability of a foreign currency mortgage is *x* per cent, and that of domestic currency mortgages is *y* per cent, then the capital charge and risk management of the lending bank should reflect that.

In the near term, admittedly, there may well be a need to rely on some use of regulatory ratios (for instance, following the example just given, by requiring higher provisioning against foreign currency mortgage lending) in countries with a recent history of instability, because the information content of economic and financial variables in such countries is rather low. In the longer-term, however, developing this *quantitative* risk management culture is essential. Rigorous quantification on the basis of past history might help banks and bank supervisors to demonstrate to clients and to the public that their credit risk charges are not arbitrary. This might help shield supervisors from political criticism. In this respect, as Chapter 8 argues, disclosure *is* important to help market discipline work effectively.

The job of bank supervision is to ensure that each bank has in place the risk management procedures that are appropriate for its particular circumstances. Because the circumstances of individual banks do differ, attempting to impose one-size-fits-all regulatory ratios could well make it harder to implement the effective supervision of the risks of currency mismatches.

Having said all that, it has to be recognized that exchange rate-related credit risk is a complex concept to make operational. In principle, the lending bank needs to know not only the currency of the loan under consideration, but also about the currency of denomination of the total portfolio of a customer. Perhaps credit registers summarizing data from all banks could incorporate such information. A second complication arises from collateral: in the case of a default after a massive currency devaluation, recovery values might perversely be higher for those who have lent dollars – because dollar-denominated claims rise relative to local-currency claims.

Chapter 9 provides a very subtle discussion of liquidity. Liquidity is difficult to define because it reflects judgments of responses to not-yet-defined shocks (how would Bank X respond to some not-yet-known financial shock?).

The first responsibility for managing liquidity should be with banks – if they get it wrong, they should pay a penalty. The authorities could reinforce this by imposing liquidity buffers – requiring, for example, that short-term foreign currency liabilities incur higher liquid asset requirements than local currency liabilities. The fact is that the central bank in highly dollarized economies may not be able to supply foreign currency as readily as domestic currency in times of stress – and this needs to be reflected in some form of liquidity ratio imposed on banks. Chapter 8 usefully surveys some practices in this area. In addition, the central bank could

also aggregate the liquidity gap analyses conducted by individual banks. It could also stress test the system for liquidity shortfalls.

If the banks and the supervisors nevertheless get it wrong and find themselves swamped by capital flight out of the banking system in a crisis, the consequences can be catastrophic. This is the very real problem that Chapter 9 addresses. It considers a pre-programmed suspension of deposit convertibility – a 'circuit breaker' – to keep the payments system working.

This idea merits careful consideration. There are, however, two problems that are reminiscent of the debate about a LOLR. The first is that an announcement in advance that circuit breakers can be activated could well create damaging expectations that legal contracts in general would not be respected during a crisis. The second is that governments, in practice, might not limit themselves to preannounced steps in the early stages of a crisis: people would suspect that behind even modest or very temporary measures lie more draconian measures.

Would it not be better to *tighten* liquidity rules on banks when aggregate liquidity begins to look doubtful? In my view, this is often not done because of fears it would encourage dollar deposits to move from local banks to banks based abroad. It would cause the local supply of dollar intermediation to contract – not popular with local banks and perhaps not popular with the country's owner of the foreign exchange reserves. Nevertheless, it should never be forgotten that it is sometimes better to allow local banking business in dollars to contract than to allow things to deteriorate so far that contracts have to be abandoned.

Part IV
De-dollarization Policy

10

Can Indexed Debt Absolve Original Sin? The Role of Inflation-indexed Debt in Developing Local Currency Markets

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10.1 Introduction

The Latin American region can be characterized as one with significant levels of financial dollarization. The region's inflation experience, with periods of high and volatile inflation, is likely to have been a key contributing factor. Over the last ten years, the average inflation rate in the region has been about 13 per cent, while the volatility of inflation has been about 15 per cent.[2] This eroded confidence in the real value of domestic currency-denominated assets and generated demand for dollar-denominated financial assets. As a result, public debt portfolios now generally carry excessive currency risk given likely future revenue streams. This raises exposure to exchange rate risk, increasing countries' vulnerability to external shocks, changes in investor sentiment and self-fulfilling runs, and exacerbating the fall-out from policy errors.[3] The situation is further exacerbated by the high foreign currency exposure of the banking sector, which could represent a substantial contingent liability on the public sector's balance sheet. As a consequence, countries are more prone to liquidity and solvency crises.

Many emerging market economies are currently grappling with the problem of how to reduce the currency risk associated with widespread dollarization. How can governments increase the attractiveness of local currency assets without, for example, causing the maturity structure of their debt portfolio to deteriorate, exchanging foreign exchange risk for liquidity risk, or incurring excessive financing costs? With a history of high and volatile inflation, and with fiscal and monetary policies that lack full credibility, this can be an almost insurmountable task.[4] For issuers of government debt, this difficulty in issuing longer-term domestic currency debt can reduce the choice of instrument that can be issued at a reasonable cost in domestic currency to short-maturity instruments, such as Treasury bills or floating rate notes. However, this increases the exposure of public debt to rollover and interest rate risk. This in turn exposes the government's balance sheet to changes in sentiment and exacerbates any risk of a solvency crisis.

This chapter considers how inflation-linked bonds can help reduce risk at reasonable cost. It provides both the general arguments and conditions for issuing these instruments, and deals with some of the technical requirements. Given the existence of a positive inflation risk premium and the limited credibility of the authorities' commitment to price stability, these instruments are likely to generate ex-post cost savings relative to an equivalent fixed-rate nominal bond, while allowing the debt manager to extend the maturity of the domestic profile. This is especially so if the authorities are committed to delivering price stability going forward. Even if this commitment is wavering, such instruments can provide cost savings because they allow private investors to protect their real return. The government can thus pocket the risk premium. The downside, however, is that it cannot inflate its way out of a crisis.

The introduction of inflation-indexed instruments can also provide a useful benchmark, allowing other inflation-linked contracts to be priced and hedged, and can encourage more widespread use of local currency instruments, helping to reduce dollarization through a positive demonstration effect. Developing the market for domestic currency inflation-linked bonds can also support the broader development of the domestic capital markets. Issuing inflation-linked bonds can change investors' perception of inflation risk; not only do they offer insurance to investors against inflation, they can also increase the credibility of monetary policy, helping to dampen concerns about future inflation.[5] This in itself should help reduce the cost of issuing fixed-rate bonds over time. At the same time, broadening the domestic currency market will facilitate the corporate sector's access to that market, allowing it to reduce its own foreign currency risk exposure and enhancing the overall stability of the macroeconomic environment.

This chapter focuses on the role of inflation-indexed debt in a prudently structured public debt portfolio. Section 10.2 reviews recent country experiences with inflation-linked bonds. Section 10.3 discusses the portfolio benefits of inflation-linked bonds. Section 10.4 contrasts inflation-indexed bonds with alternative forms of indexation or non-indexed debt. Section 10.5 considers some of the wider benefits with respect to developing local currency markets, while Section 10.6 addresses some concerns about spill-over into the wider economy. Section 10.7 deals with some of the operational issues that arise when developing a market in these securities. Section 10.8 concludes.

10.2 Country experiences

At a global level, inflation-indexed debt is a growing asset class. The Barclays Capital World Inflation-linked Bond Index (Table 10.1) shows that the market capitalization of such instruments has more than doubled in the last five years, growing from $267 billion in December 1999 to $680 billion by December 2004. In the last two years, the contribution of the euro sector to growth in this market[6] has increased significantly – from five percentage points in 2002 to 10 and 12 percentage points in 2003 and 2004 respectively – while the contribution from the sterling market has stayed relatively constant at around 8 percentage points. The

Table 10.1 Market value of inflation-linked bonds ($million)

	Euro non-govt	Euro govt	Sterling non-govt	Sterling govt	US	World
Dec 2000	2,210	12,409	3,072	105,399	123,334	267,456
Dec 2001	5,992	19,053	5,116	104,845	125,917	274,214
Dec 2002	8,127	31,462	9,803	122,104	167,494	359,908
Dec 2003	11,536	62,505	14,979	149,061	202,801	479,855
Dec 2004	14,591	115,115	19,711	183,562	281,052	679,944

Sources: Barclays Capital Inflation-linked Indices; Datastream.

dollar market remains, however, the largest source of growth, contributing 16 percentage points to global market growth in 2004.

To date the market has been dominated by government issuers; however, the non-government sector, particularly in Europe, is beginning to develop and is now growing rapidly. Over the same five-year period the euro-denominated and sterling-denominated non-government sector, together, grew by more than six times, although this sector still only represents 5 per cent of the total market.

The growth of this asset class has been supported by significant amounts of financial analyst research and investor education, with investment banks actively promoting these instruments to their clients. As a result, inflation-linked bonds have now become a very familiar and widely accepted asset. The current conjuncture represents, therefore, an opportune time to consider issuing such instruments.

All of the G7 countries, including most recently Germany, now issue inflation-linked debt, and for some it represents a significant proportion of their debt portfolios. There has been a variety of reasons cited for the growth in these instruments. Several countries have noted the cost advantages of this type of debt over fixed-rate nominal bonds (UK, USA);[7] others note the positive benefits in terms of signalling the government's intentions to secure price stability (South Africa).[8] Others, however, have used inflation-linked instruments as a means to diversify financing instruments (Mexico and Sweden).[9]

Appendices 10.1 and 10.2 describe in some detail the UK's recent experience and outline some of the key characteristics of the most developed inflation-indexed debt markets. Some key developments are worth emphasizing here. The UK led the way for the G7 countries, issuing its first inflation-linked bond in 1981. Two main factors were put forward for this decision: (i) inflation-linked bonds should improve monetary control; and (ii) such bonds would eliminate the risk of inflation uncertainty for both the issuer and the investor, which should generate cost savings for the government. Inflation-linked bonds now represent about 25 per cent of the total debt portfolio and the UK is the second-largest market for inflation-linked securities in the world. Canada was the next G7 country to enter the market in 1991, introducing an important innovation in instrument design – issuing real

return bonds with a three-month lag in indexation and adopting a simplified price-yield calculation. This design has been adopted as the international standard. In Sweden, the (re-)launch of inflation-linked issuance in 1992 was driven by a devaluation in the Swedish krona, which significantly increased the cost of foreign currency debt.[10] This required the debt management authorities to find an alternative source of financing that would be of reasonable cost given that inflation expectations at the time were very high. The US introduced inflation-linked bonds in 1997; this is now the largest market in the world. France followed soon after, in 1998.

The recent surge in activity in the market for inflation-indexed debt can be linked to the entry of Italy, Greece and Poland in the euro-zone with new issues launched in 2003 (Italy and Greece) and 2004 (Poland). Also notable is Japan's entry into this market in 2004, given its need to diversify the instruments and sources of its financing, and the expected demand from its pension industry for such instruments.

Within the Latin American region, there is also a long history of inflation-linked debt. Chile has probably the largest and most developed market for inflation-linked bonds. Walker (2002) demonstrates how these instruments have helped complete financial markets and fostered the development of the wider capital market. He notes some particular factors that contributed to the successful acceptance of these instruments: (i) the unidad de fomento (UF) is produced by an independent entity, ensuring its credibility; (ii) the UF is accepted as a valid alternative currency in law; and (iii) tax regulations are consistent with a generalized indexation of the economy, with the impact of unexpected inflation tax neutral for investors.

More recently (in 1996), Mexico introduced its newest inflation-linked instrument, the Udibono. At the time, the three key benefits of Udibonos for the issuer were perceived to be:[11] (i) an extension of the maturity of public debt; (ii) a lowering of funding costs; and (iii) a diversification of public financing instruments, reducing rollover risk. The first Udibonos allowed an extension of the maximum maturity of public domestic debt to be extended from less than one year to three years; Udibonos were subsequently issued with a ten-year maturity. In 2000, the Udibono programme was scaled back in order to avoid crowding out the corporate sector. However, at that point, market conditions were such that the Mexican Treasury was able to extend the maximum maturity of nominal fixed-rate bonds to three and five years; Mexico currently issues twenty-year fixed-rate bonds. The move into Udibonos in 1996 helped Mexico increase the proportion of domestic currency debt in its public debt portfolio from 44 per cent in 1996 to 61 per cent four years later; by end-2002 this proportion stood at 66 per cent.[12]

Other recent examples of Latin American issuers using inflation-linked bonds to successfully increase the maturity of the domestic debt include Brazil, Colombia, Peru, and Uruguay. Brazil has successfully issued a 2045 NTN-B,[13] while Colombia has been able to issue inflation-indexed bonds at up to fifteen-years' maturity. Peru has pursued a strategy of extending the tenor of its inflation-indexed bonds, from seven to twenty years, in parallel with increasing the tenor of its nominal debt, from five to fifteen years. Following its recent debt restructuring, Uruguay has begun using inflation-indexed debt to reduce its exposure to FX liabilities and to

facilitate de-dollarization, with the government issuing inflation-linked bonds at the five-year maturity and the Central Bank issuing them at the ten-year maturity.

These recent experiences illustrate how inflation-linked debt can be used to diversify away from foreign currency-denominated issuance, thereby reducing exchange rate risk, without shortening the maturity of the portfolio and taking on excessive rollover risk. Further details on the more recent Latin American experience with inflation-linked bonds are provided in Box 10.1.

Box 10.1 Selected Latin American experience

Several Latin American countries issue inflation-linked bonds; only four are considered below but others include Argentina, Bolivia, Chile and Costa Rica.

Mexico: Following the launch of the Udibonos in 1996, Mexico successfully extended the maximum maturity of its domestic fixed-rate nominal debt from one year to five years by 2000 and twenty years by 2004. Over the same period, the average maturity of domestic debt increased from 283 days in 1996 to above 1,000 days at the end of 2004. It is expected to be extended by another 140 days by the end of 2005. By 2000, corporate issuance of inflation-linked bonds had reached significant levels, allowing the Udibono programme to be scaled back to avoid crowding out the private sector.

Brazil: Since 1994, Brazil's medium-term debt management strategy has focused on reducing interest and exchange rate exposure by building domestic fixed-rate and inflation-linked debt. However, in the short term the Brazilian public debt authorities were constrained by the limited demand for longer-dated fixed-rate instruments. Faced with that constraint, they used two types of indexed instruments – floating rate notes (LFTs) and inflation-linked bonds (NTN-Cs and NTN-Bs) to extend the maturity profile of their domestic portfolio. Between July 1994 and December 2001, they successfully used these instruments to extend the average maturity of domestic marketable debt instruments by over seven times, from 4.6 months to 35 months. Initially, the maximum maturity of inflation-linked bonds was 30 years but they now have a 40-year bond outstanding (2045 NTN-B). As at end-2004, Brazil had 15 per cent of its domestic debt portfolio in inflation-linked bonds, an increase of 9 per cent relative to 1999. Over the same period FX-denominated or linked debt declined from 23 per cent to 5 per cent, the proportion of price-indexed debt increased from 9 per cent to 20 per cent and the proportion of floating rate notes has remained unchanged. However, this masks the fact that between the summers of 2001 and 2003 the share of fixed-rate debt fell sharply with initially FX debt and then floating rate notes absorbing those changes.

Colombia: Colombia's medium-term public debt strategy seeks to reduce exchange rate risk by cutting the proportion of FX-denominated debt. At the same time, a medium-term target share of 8 per cent for inflation-linked bonds has been established. Colombia's recent inflation experience, with inflation down in the single figures, has only just allowed the issuance of a nominal fixed-rate bond at a maximum maturity of ten years.

Peru: In March 2003, Peru published a debt management strategy aimed at reducing exposure to market risk and contributing to the de-dollarization of the economy. Inflation-linked bonds were issued with a minimum tenor of seven years alongside shorter-dated (up to five-year) fixed-rate nominal bonds. The strategy also aimed at extending the maturity of fixed-rate debt out to fifteen years in due course as the market developed. By December 2003, the tenor of inflation-linked bonds was extended to ten years, while the maximum tenor of fixed-rate nominal bonds remained at five years. However, by the end of 2004, the Peruvian Treasury successfully issued a seven-year fixed-rate bond and extended the maximum tenor of its inflation-linked bonds to twenty years; by September 2005, it had issued a 30-year inflation-linked bond and achieved its goal of issuing a fifteen-year fixed-rate nominal bond.

10.3 The portfolio benefits of inflation-indexed debt

Limiting costs

Issuing inflation-indexed debt can be a cost-effective means of lengthening maturity and reducing exposure to foreign currency (or indexed) debt, especially in an environment where credibility of monetary (and fiscal) policy is lacking. Contrary to what is sometimes considered, issuing inflation-indexed debt can enhance the credibility of the stated goals of monetary policy, notably when they involve a reduction in inflation. By issuing cost-efficient debt and reducing the cost of deflating, objectives that call for a reduction in inflation become more credible, as they are less likely to be overshadowed by fiscal dominance problems (i.e., when additional fiscal costs require inflationary financing).

Observers will also recognize that this provides a mechanism through which the government will directly bear the cost of failure to deliver on its policies. It is for this reason that Margaret Thatcher referred to inflation-linked bonds as 'sleeping policemen'.[14] Unlike with fixed-rate debt, there is no transfer of the risk of high inflation to the private sector; investors' real returns are protected. Thus, the government gives up part of its escape route of reducing the government debt burden through inflation. However, it should be noted that such an escape route is not cost effective in the long run, as it will increase the inflation premium on future debt and eventually require higher real adjustments in expenditure and taxes. This suggests that decisions to issue inflation-linked debt should follow an explicit recognition of the need for real measures to deal with government solvency problems. At the same time, the issuance of inflation-indexed debt should be embedded in monetary policies that aim to deliver (greater) price stability. The government ties (to a somewhat greater extent) its own hands, but in return gains (some of) the risk premium associated with making a binding commitment – i.e., inflation-indexed debt resolves part of the time inconsistency problem that results from not being able to make a binding commitment to a given inflation target or monetary policy (Kydland and Prescott, 1977; Backus and Driffill, 1986).

The cost advantages to issuing inflation-linked debt can be broken down into two distinct sources:

- it eliminates the inflation risk for investors, thereby reducing their required risk premium; and
- it takes advantage of the information asymmetries that can arise where the credibility of monetary policy has not yet been established but where the authorities are truly committed to price stability (this would be reflected in market expectations of inflation outstripping those of the authorities).

These potential cost savings can be illustrated by considering the following relationship:

$$i_t = r_t + inf_t^e + risk \qquad (1)$$

where i_t is the nominal redemption yield on a fixed-rate bond of maturity t, r_t is the equivalent real yield on a similar inflation-linked bond, inf_t^e is the expected rate of inflation over the life of the bond and *risk* is any risk premium. This risk premium is likely to capture both the inflation risk premium, which is likely to be related to the volatility of inflation, and any relative difference in other risk factors between nominal and real bonds.[15] The most important of these residual factors is likely to be differences in the liquidity of both bonds. Box 10.2 discusses the potential scale of these differences. However, where neither market is particularly

Box 10.2 The liquidity of inflation-linked bonds

In general, the market for inflation-linked instruments tends to be less liquid than that for fixed-rate securities. This reflects the nature of the investor base, principally pension and insurance companies, which tend to be 'buy and hold' in nature.

One indicator of liquidity is the bid-ask spread. Inoue (1999) reports that bid-ask spreads on inflation-linked bonds tend to be significantly larger than on fixed-rate nominal bonds. Table 10.2 shows the reported spreads for ten-year bonds expressed in price terms. Sack and Elasser (2004) report that for longer-maturity bonds the spread on US Treasury inflation-indexed debt (TIIS) widens considerably – up to eight times – while it only doubles on nominal Treasuries.

Table 10.2 Bid-ask spreads (per 1/100th of currency unit)

	10-year fixed-rate bond	**10-year inflation-linked bond**
Canada	5	25
US	3.1	6.3
UK	4	15
Sweden	15	39

Source: Inove (1999).

Similarly, Deutsche Bank (2002) reports that the spread on Mexican inflation-linked bonds was 25 basis points (in yield terms), while it was only 10 basis points for fixed-rate nominal bonds. This is despite the fact that the stock of both instruments was of a similar scale (MXN 91 billion and MXN 128 billion respectively).

However, the bid-ask spread is only a partial measure of liquidity as it does not take account of differences in the standard trade size of each instrument. For example, Deutsche Bank (2002) reports that, in Mexico, not only is the spread narrower, the standard trade size in fixed-rate bonds tends to be larger – up to three times at the medium sector – than in inflation-linked bonds. The standard trade size in inflation-linked bonds is reported to be MXN 10 million, while for fixed-rate bonds it is reported to be MXN 50 million at the short end, MXN 30 million at the medium sector and MXN 10 million at the long end. Similarly, Sack and Elasser (2004) report that the standard trade size for nominal US Treasuries is four times that of inflation-linked, $100 million relative to $25 million.

Another indicator of liquidity is turnover. For example, turnover in inflation-linked bonds in the UK only accounts for about 7 per cent of total turnover, despite the fact that inflation-linked bonds make up about 25 per cent of the total gilt portfolio.

well developed, the differences in liquidity are likely to be marginal and the risk premium will be dominated by the inflation risk premium.

In practice, we cannot separately observe the market yields, the expected rate of inflation and the risk premium. Instead the break-even inflation rate (bei_t) is calculated, so that:

$$bei_t = i_t - r_t = inf_t^e + risk \qquad (1')$$

Effectively this means that, if inflation over the life of the inflation-linked bond is in line with the break-even inflation rate, the issuer and investors will be indifferent between the nominal and real bond. Provided that inflation does not exceed this rate, the issuer will realize a cost saving by issuing an inflation-linked bond relative to a nominal bond. The rationale for the cost saving is thus tied to two key factors: (i) policy credibility; and (ii) the risk premium.

Where the market's expectations of future inflation have not adjusted to reflect the true policy commitment, inf_t^e will be a biased estimate of future inflation, overstating the most likely outcome for inflation. This 'error' in expectations could generate significant savings for the authorities. The UK's experience suggests that the total cost benefit in the absence of full policy credibility could be of the order of 135 basis points at the five-year horizon and 200 basis points at the ten-year horizon (Appendix 10.1).

However, even if policy is fully credible and the market's expectations, inf_t^e, are fully rational, there are still likely to be cost savings given the inflation risk premium. The market will be willing to pay for protection against unexpected inflation surprises. For example, Campbell and Shiller (1996) suggest that an inflation risk premium of between 50 and 100 basis points for a five-year bond would be reasonable for the US. For the UK, it may be of the order of 25–35 basis points at the five-year tenor (see Appendix 10.1).

A similar (forward-looking) indicator of the scale of possible cost savings can be derived from the Peruvian seven-year nominal and inflation-linked bonds issued in August 2004. Figure 10.1 shows that the break-even inflation rate on issue was 5.82 per cent. Since then, the break-even inflation rate has narrowed and is highly correlated with the evolution of actual consumer price inflation. Over the life of the bond to August 2005, inflation has averaged 2.66 per cent. If inflation is maintained at the target level of 2.5 per cent through the residual life of the bond to 2011, the authorities would have saved around 330 basis points relative to the alternative of raising the equivalent quantity of financing by issuing more of the nominal fixed-rate bond. Even if inflation comes in at the upper bound of the target range, i.e., 3.5 per cent, the authorities will still have secured a saving of 245 basis points.[16]

A similar indicator for Brazil, based on the nominal and inflation-linked bonds maturing in 2008, suggests that issuing a four-year inflation-linked bond in 2004 might have secured savings of around 200 basis points; however, in that case, the relevant price index is not the one that is subject to the monetary policy objective and so the outcome is likely to be a bit more uncertain.[17]

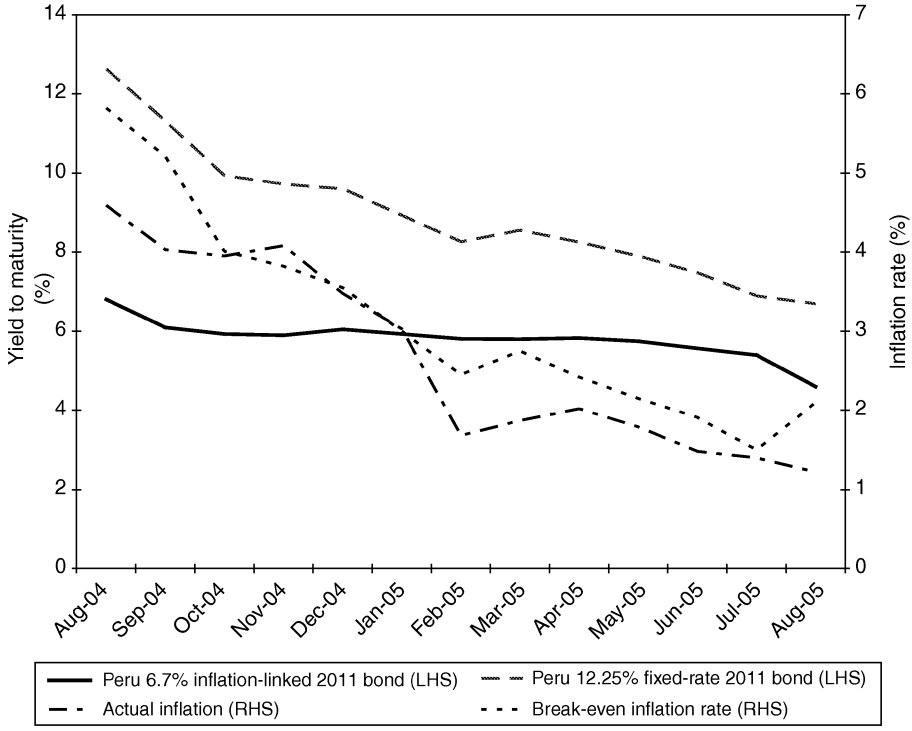

Figure 10.1 Peru: break-even inflation (for the seven-year bond)
Sources: Bloomberg; Datastream.

As mentioned before, the inflation risk premium is related not only to the level of inflation but also to the volatility of inflation. While many Latin American countries have successfully reduced the level of inflation in recent years (see Table 10.3), the volatility of inflation remains high in several countries. This suggests that the inflation risk premium is likely to be significant in this region, indicating scope for substantial cost savings.[18]

Clearly, the benefits discussed above will reduce the costs of deflation, increasing the credibility of the authorities' commitment to price stability. However, just how effective this might be will depend to some extent on how the instruments are designed.[19] In particular, it will depend on the lag in indexation. If the lag is long, say a year, debt service costs will reflect the earlier, more elevated level of inflation, rather than the current, deflated level. Therefore, especially when a government is committed to bringing down inflation, the lag ought to be relatively short.[20]

Limiting risks

Debt managers are concerned not only with cost, but also with the risk embodied in the structure of their debt portfolio. From a risk management perspective it is

Table 10.3 Latin American inflation experience, 1999–2004

Country	Inflation (December 2004)	Mean inflation	Standard deviation of inflation
Argentina	6.10	7.0	13.0
Bolivia	4.62	2.8	1.6
Brazil	7.61	8.1	3.6
Chile	2.43	2.9	1.2
Colombia	5.50	7.9	2.1
Costa Rica	13.13	10.5	1.4
Dominican Republic	28.7	20.3	19.2
Ecuador[1]	1.9	31.8	35.9
El Salvador[1]	5.4	2.9	1.5
Guatemala	9.2	6.9	1.6
Honduras	9.2	8.8	1.5
Mexico	5.19	7.8	4.5
Nicaragua	8.9	7.3	3.0
Paraguay	2.8	9.1	4.5
Peru	3.48	2.6	1.5
Uruguay	7.59	9.7	7.5
Venezuela	19.19	21.4	7.0

Source: Datastream.

Notes: Based on monthly inflation over five years from 1999 to 2004.
[1] Ecuador and El Salvador have full de jure dollarization.

important to consider whether the structure of the portfolio can be chosen so that changes in debt-servicing costs as a result of exogenous shocks offset, partially or otherwise, other changes to (net) government expenditure as the result of the same shocks.[21]

Goldfajn (1998) shows that such risk minimization is accomplished by choosing debt instruments which both ensure a low volatility of returns and provide a hedge against fluctuations in the primary budget. This is effectively an asset-liability management (ALM) approach which suggests that debt managers should begin by characterizing the various assets and liabilities on the government's balance sheet and then issuing liabilities with similar characteristics to the net asset position. This means that budgetary pressures arising from unexpected changes in debt service costs can be mitigated, as revenues will move in line with costs. In general, a significant part of government revenues will be closely correlated with inflation, i.e., in effect price-indexed.[22]

More specifically, when a country tends to experience demand-driven business cycles, where output and inflation move in the same direction, inflation-linked debt mitigates the impact of any negative demand shocks on the fiscal position. In other words, during a positive output shock, inflation is higher and the government pays more on debt service, but can do so on account of having more revenue. In contrast, during a negative shock, revenue falls short but this is partly

offset by lower inflation and expenditure on debt. This positive fiscal insurance or tax-smoothing property of inflation-linked debt is emphasized in Giavazzi and Missale (2004), who show that the optimal share of inflation-linked debt in the portfolio increases with the covariance of output and inflation.[23]

10.4 The alternatives to inflation-indexed debt

Floating-rate debt

While inflation-linked bonds are one form of variable-rate debt, instruments indexed to a short-term interest rate (floating-rate debt) are also commonly issued, principally Treasury bills and floating rate notes (FRNs). Treasury bills tend to be issued with a maximum maturity of one year, while FRNs tend to have longer maturities, frequently up to five years.

The drawback of shorter-dated and floating-rate debt is their sensitivity to rollover and interest rate risk. Particularly when such instruments represent a large part of the debt, shifts in sentiments, policies or exogenous factors can trigger rapid changes in the conditions of issuance and lead to debt-sustainability problems. This can further exacerbate issuance conditions, generating a vicious cycle.

As discussed in IMF (2004) and Allen *et al.* (2002), issuance of short-term and variable-interest debt is especially risky when the exchange rate is pegged.[24] Under a fixed exchange rate regime, interest rates need to respond to maintain the exchange rate peg. This can rapidly lead to sustainability problems, which in turn can trigger even higher interest rates and rollover problems (e.g., Mexico, 1994).

Such instruments are more appropriate when the exchange rate is flexible. Under a flexible exchange rate, liquidity remains in the country and rollover is more assured, while interest rates and monetary policy can be independently determined and the exchange rate absorbs more of any shock.

Some commentators note that returns on FRNs can be similar to the return on shorter-dated inflation-linked bonds; both secure a real rate of return. However, the differences between the two instruments become more pronounced as maturity is extended, principally to the extent that the market's current expectations about the future path of real rates that are incorporated and locked-in through the inflation-linked bond may not be a good predictor of future real rates. In addition, there is likely to be more noise in the return on the FRN as the reference rate may respond to 'noise' about developments in prices or the real economy. This means that an issuer will face greater volatility in real costs by issuing FRNs, increasing its risk. Giavazzi and Missale (2004) demonstrate that, even over the relatively short horizon of a year, inflation-linked bonds dominate FRNs with respect to their fiscal insurance or tax-smoothing properties, i.e., from a risk management perspective inflation-linked bonds are superior. However, there may be some cost benefits to issuing FRNs over inflation-linked bonds if the issuer judges the path of real rates implicit in the cost of issuing an inflation-linked bond to be a biased predictor of future real rates, perhaps because fiscal policy credibility has not yet been established.

Foreign currency-denominated debt

The ALM approach suggests that, if there is a significant source of foreign currency(FX)-denominated revenues and given a healthy current account, there could be a role for FX debt in the portfolio.

Nevertheless, many countries issue FX debt primarily for cost reasons, and also because they have few alternatives. Cost can indeed be a good reason to issue FX debt, but vulnerabilities need to be offset. For example, most concessional debt is in foreign currency but at long maturities and low rates, offsetting the added vulnerability. Alternatively, the cost of issuing FX debt might be lower due to the fact that the supply of capital may be larger in external markets or some mispricing persists. This would be the case, for example, if the exchange rate does not accurately reflect prospective improvements in the long-term terms of trade,[25] or if there are market imperfections that reflect the absence of perfect capital mobility.

Regardless of the rationale, where a country has issued significant amounts of FX-denominated debt, it can become highly vulnerable to exchange rate shocks. This exposure, if warranted by cost considerations, can be offset by judiciously used buffers. Adequate reserves and long-dated maturities can be used to limit liquidity and rollover risks, while fiscal buffers (e.g., using the savings on the debt expenditures to reduce fiscal deficits) can protect against upside risk in the form of potentially higher interest payments when translated into domestic currency.

Relative to inflation-linked debt, while there may appear to be some cost advantages in issuing FX debt, inflation-linked debt has more favourable risk characteristics. As a country generally has much more control over its inflation than its real exchange rate, this makes inflation-indexed debt more predictable and manageable, obviating the need for buffers.

FX debt will, however, remain a useful and important source of financing for many countries. In particular, it can be useful for countries that wish to retain some presence among the international investor base in order to reduce the cost of future market access.

Nominal fixed-rate debt

As mentioned above, inflation-indexed debt can provide some fiscal insurance against negative demand shocks. Similarly, medium- to long-dated fixed-rate debt can provide some fiscal insurance against the possibility of negative supply shocks. For example, while, in general, output, government revenues and inflation covary positively, in the event of a negative supply shock, output and revenues fall while inflation rises. Under these circumstances, it will be useful to have some capacity, in the form of nominal fixed-rate debt, to inflate away the real cost of servicing the debt. Again, Giavazzi and Missale (2004) find a role for nominal fixed-rate debt in a robust debt portfolio. Fischer (1983) also discusses the positive role that nominal fixed-rate debt can play when inflation and output shocks coincide.

We have discussed above how the existence of inflation-linked bonds can facilitate the issuance of longer-term fixed-rate nominal bonds. In principle, however, nominal fixed-rate debt can also be issued in the absence of inflation-linked debt

by governments that seek to reduce inflation, even though this commitment may not be quite credible. This will require the government to pay the excess of the market's inflation expectations over its own expectations/commitment.[26] By nonetheless pursuing such a costly route it may demonstrate that it is truly committed to achieving low inflation, and may, during further rounds of reducing inflation, gain through reduced cost.

Is such a route of self-flagellation the optimal way to cast off the mark of 'original sin'? There are a number of drawbacks to such an approach. First, the disinflation programme may not survive the process because it is too costly, raising doubts about debt sustainability and increasing the risk premium on debt, resulting, through fiscal dominance, in a retreat. Second, rather than 'burning money' to signal commitment, the government could use the savings on inflation-indexed debt to reduce the fiscal deficit, thus signalling that it can maintain prudent fiscal balances and creating margins that underpin further efforts for deflation. In this way, it can provide a more positive environment is established for issuance of nominal debt at a later stage.

In general, inflation-indexed debt is a complement rather than a substitute for nominal fixed-rate debt and the issuance of indexed debt can facilitate the greater use of fixed-rate debt by reducing its cost. When countries suffer from a lack of monetary or fiscal credibility it can help demonstrate the country's commitment to lower inflation in a cost-effective way, helping to achieve the objective of low inflation. Once lower inflation is achieved, the proportion of inflation-indexed debt can be reduced, if required (e.g., Chile). In a low-inflation environment investors are likely to prefer the nominal certainty of fixed-rate debt.[27] However, even in such an environment, inflation-indexed debt continues to have a role to play in a well-diversified debt portfolio given its risk characteristics, catering to the relative demands of specific investors and aiding in the identification of a real yield curve.

10.5 Market development benefits of inflation-linked instruments

Facilitating wider market development

While inflation-indexed debt can bring significant benefits to debt managers in terms of its cost and risk properties, it also has a role to play in developing local financial markets. Walker (2002) demonstrates that the existence of inflation-linked debt helps complete financial markets by providing an instrument that allows investors to maintain the real value of their returns.

By demonstrating a government's commitment to price stability and by directly bearing the cost of unanticipated inflation through issuing inflation-linked bonds, a government can help reduce the size of the inflation risk premium. This reduces the cost of nominal debt and allows governments to extend the maturity of the fixed-rate element of their debt portfolio at a reasonable cost. The recent Mexican and Peruvian experiences demonstrate how inflation-linked bonds can

help facilitate the development of a longer-term fixed-rate market in government bonds (see Box 10.1).

The Chilean experience has shown that providing inflation-linked instruments can also provide the basis for extending the means for the private sector to finance itself. The government's inflation-linked instruments can provide a reference point against which the private sector can price itself. In addition to providing a pricing reference, local government bonds can also be used by financial intermediaries to manage their own portfolio risk, further facilitating the private sector's access to local capital markets. This helps private borrowers reduce the currency mismatch on their balance sheets, improving the robustness of the economy overall.

Additionally, where monetary policy credibility is lacking, the retail sector may have an appetite for indexed savings products, such as indexed time deposits, pensions, or insurance policies. The regulatory environment could influence such developments. For example, where differential reserve requirements are applied to local and foreign currency bank deposits, this would allow banks to offer relatively more attractive deposit rates in local currency, encouraging demand. Such demand would lead to a corresponding increase in interest from the banking and contractual savings sector to hedge that risk, adding to liquidity in the primary market for inflation-linked bonds.[28] While the contractual savings sector would tend to be more 'buy and hold' in nature, the banking sector would probably be more active in the secondary market as its liabilities would tend to have a shorter duration.[29] Regulatory developments could, in certain circumstances, also encourage the contractual savings industry to be more active in the secondary market. For example, where accounting regulations require the use of real rates to discount the future liabilities of pension or insurance companies, this can create an incentive for these investors to hedge their balance sheet risk by investing in real assets and adjusting their portfolios with changes in the duration of their liabilities.

Again, where monetary policy credibility is lacking, the banking and mortgage sector may prefer to issue inflation-linked loans, such as mortgages, over nominal fixed-rate equivalents, thereby protecting real returns. Inflation-linked government bonds would provide the necessary pricing reference and, depending on how the loans were financed, the appropriate hedge. This would generate more interest, and consequently more liquidity, in the market for inflation-linked instruments more generally. Such mortgages or loans may be a better match for the personal sector, given the likely source of revenues in this sector, than dollar-denominated equivalents, thereby reducing the currency mismatch on the personal sector's balance sheet.[30]

Finally, where local markets are relatively immature and generally illiquid, care is needed to avoid fragmenting the market. This would be the case, for example, when different instruments are offered that might be considered close substitutes, say inflation-linked bonds linked to different price indices. Using multiple indices will complicate the market's understanding of the instrument. Sack and Elasser (2004) show how unfamiliarity with an instrument can constrain activity in the early stages of market development. This suggests that the authorities should consider whether a specific education programme on how these instruments work is

needed to support market development, particularly for the retail sector. Market intermediaries can support these market awareness initiatives by publishing relevant research and analysis. This is one reason why the current conjuncture, with global investment banks producing significant amounts of research on this asset class, represents a good opportunity to introduce these securities.

In addition, splitting the required financing across multiple bonds will result in each issue being smaller. Again Sack and Elasser (2004) show that the relative supply of an instrument will affect its resultant liquidity.

Real yield curve

In addition, one benefit of inflation-indexed debt, often mentioned by commentators, is that issuing inflation-linked instruments allows a real yield curve to be observed, providing policy-makers with information about market expectations of future inflation. Deacon and Derry (1998) discuss in some detail the derivation of the inflation term structure from the real yield curve, highlighting some of the complexities involved. Breedon and Chadha (1997) show that the inflation term structure derived from the real yield curve provides a measure of expectations of future inflation that is superior to that contained in nominal yields. While this measure performs well relative to other macroeconomic modelling techniques in predicting changes in future inflation, it tends to overestimate the level of future inflation due to the existence of the risk premium. The information contained in the real yield curve is also helpful for market participants in helping to guide long-term investment decisions by providing an indication of the real opportunity cost of capital, again providing support to local capital markets.

However, the extent to which the real yield curve can be determined will depend on the spread of maturities of the inflation-linked bonds that exist. In practice, the curve may only be reliably defined for certain maturity sectors, for example, the five- to ten-year tenor, if the authorities have only issued bonds with maturities within that range. Even as these bonds age, it may not be possible to reliably determine the curve for tenors shorter than five years if activity in the older bonds is such that reported prices do not truly reflect the market's valuation. In addition, it is not possible to augment that portion of the real yield curve determined by inflation-linked bonds with information derived from a nominal yield curve determined for a different maturity segment. For example it would not be possible to fill the gap between zero and five years with information on nominal yields, determined from nominal bonds that span that maturity segment. That would in effect involve comparing 'apples' and 'oranges', violating a key principle underlying yield curves that the characteristics of all the underlying bonds must be similar in nature.[31]

10.6 Spill-over effects

In both Chile and Israel, a concentration of government bond issuance in inflation-indexed instruments has led to widespread indexation of the economy. This can be a source of concern as policy-makers might fear that such indexation would

result in inflation expectations becoming endemic, increasing the persistence of inflation and working against policy-makers' efforts to deliver price stability. For example, excessive indexation would mean that an inflation shock could persist leading to sustained inflation. However, in the aftermath of the oil price shock of 1974, Fischer (1983) found no evidence that higher indexing resulted in higher inflation in general. He attributed this to the implementation of specific policy responses in those countries with more widespread indexing. Therefore policy actions can mitigate the risk that indexation will lead to sustained inflation in the economy.

Similarly, consider the case of Chile, a highly indexed economy. Its experience of inflation has been exemplary (see Figure 10.2), being relatively low and stable over the last ten years or so, and a (cursory) examination of the data does not suggest that inflation has been significantly more persistent in Chile than in other countries in the region.

Others contend that the existence of inflation-indexed instruments makes it easier for people to live with inflation and will reduce support for anti-inflationary policies. However, by issuing public debt linked to the price level, the government takes on inflation risk and consequently has a direct interest in managing that risk. It is also the economic agent that is best placed to manage that risk as it can influence the price level through its monetary and fiscal policies. Given that it will bear

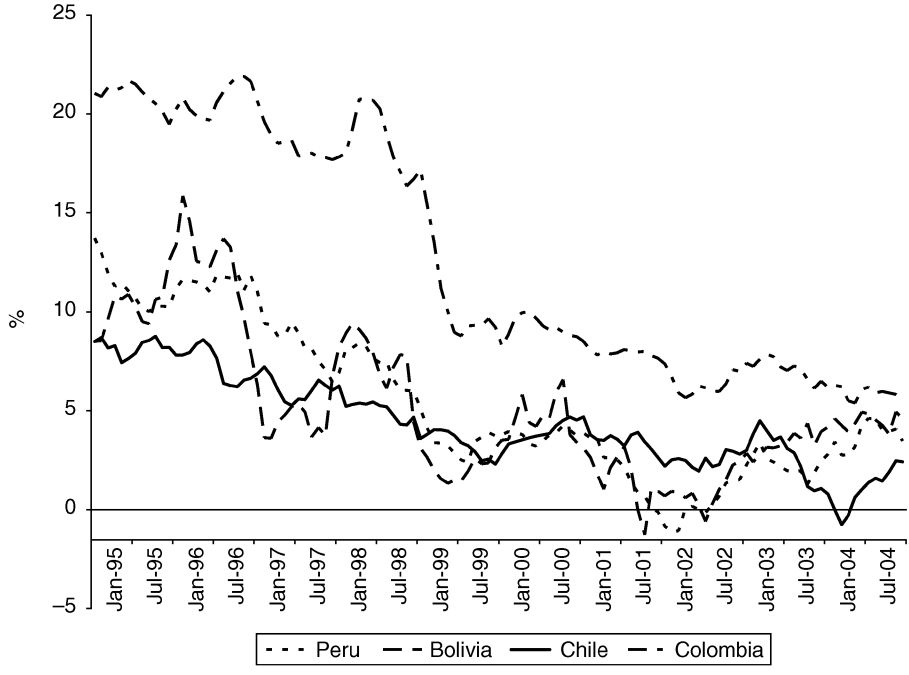

Figure 10.2 Inflation experience of selected Latin American countries, 1995–2004
Source: Datastream.

the direct cost of policy failure, it has a clear incentive to commit to active policies that deliver price stability.

Regardless of the possible consequences, any concerns about the spread of indexation could be mitigated by presenting the issuance of inflation-linked bonds within the context of a more complete strategy towards developing the local market. When the issuance of inflation-linked bonds is accompanied by an aspiration to move towards a broader use of fixed-rate nominal bonds, this should limit the scope for widespread indexation. Hence, we would not advocate, as in Chile or Israel, only issuing inflation-linked domestic currency government bonds. Instead, the experience of other issuers, where inflation-linked bonds represent a significant but not the majority share of the debt portfolio, suggests that this does not promote indexation. As in Mexico, Brazil or Peru, issuing long-dated inflation-linked bonds should help pave the way for gradually introducing longer-dated fixed-rate nominal bonds. Over a period of, say, four to five years, the issuer can gradually extend the tenor of its fixed-rate nominal bond issuance as market conditions stabilize and the credibility of macroeconomic policies increases.

10.7 Operational issues

Instrument design

The liquidity of financial instruments is enhanced when investors find them easy to trade. This has implications for choice of index and indexation methodology. International standards have now been established and should be considered when designing any new instrument.

The key condition for issuing inflation-indexed debt is having a reliable, familiar index that is not subject to government interference. In addition, a fixed release schedule is required to enhance transparency and credibility. Several steps can be taken to ensure reliability and independence. The independence of the compilation agency can be established by law or through other governance arrangements. The Chilean experience could provide a suitable example. Access to the data prior to the release should also be curtailed or eliminated. In general, the principles underlying the Special Data Dissemination Standards (SDDS) and the IMF's Data Quality Assessment Framework (DQAF) could provide guidance.

In addition to being credible, the index should be comprehensive in its coverage, frequent in its publication, transparent, well understood by the market, not subject to frequent change (in composition or in methodology of calculation) and (ideally) not subject to revision.[32] For many countries, it is not possible to have an index that is never revised. Thus, some countries (France and the USA, for example) use the first release of the data to determine the coupon and redemption flows. If the data is subsequently restated, no adjustment is made to already-issued coupon and redemption flows. However, an adjustment might be made in the following coupon payment.

A short indexation lag is attractive to both issuer and purchaser on risk management grounds. For a public issuer, fiscal insurance is a key benefit, as government revenues and debt-service costs move together. Tax revenues, in particular

value-added tax, are effectively instantaneously indexed. Especially when deflation is the objective, a short indexation lag reduces the large one-off costs of reducing the inflation rate. From an investor's perspective, preserving the real value of his investment is key. Any significant lag reduces the degree of inflation protection, particularly if there is a shock to inflation shortly before redemption. This reduces the relative attractiveness of inflation-linked instruments as a 'safe haven' relative to FX-denominated instruments, which do offer instantaneous protection. A key factor contributing to the need for some lag, however, is the time required to collect the information and publish the index.

From the government's perspective, the GDP deflator might provide a greater degree of fiscal insurance than the CPI.[33] However, the GDP deflator tends to be published with low frequency and a significant lag. Moreover, it is frequently revised, reflecting the complexity of its computation. Especially in countries where there is any doubt about the objectivity of statistics, GDP deflators are therefore not a good alternative.

From an investor's perspective, an index that tracks the average level of earnings could also be attractive, particularly when pensions (or mortgages) are indexed to average earnings. However, this would be less desirable for governments. For example, if average earnings increase faster than the rate of productivity, this may put pressure on profits, reduce investment and eventually result in slowing real GDP growth and real taxes, along with higher unemployment and related government expenditures. This index may also be flawed from the perspective of its coverage. Wage and earning statistics often cover a smaller share of the economy than consumption-based statistics, especially where self-employment is important. In addition, if there is widespread dispersion in wage or earnings growth that is higher than the dispersion in CPI changes, this index would be less attractive for individual or sector-specific investors. Such problems explain why, for reasons of robustness and transparency, countries have generally adopted the CPI as the index of choice. It is widely understood and is published at a relatively high frequency and with a relatively short lag – generally only a month or two. While this leaves some exposure to basis risk relative to the GDP deflator, earnings, or regional price levels, the risk is significantly less than that associated with any FX-linked instrument.

As noted above, simplicity in calculation is also an important factor in the degree of acceptance of indexed instruments. Secondary market trading requires a daily measure of the inflation accrued since the last publication of the index. For consistency and to avoid any differences of opinion between market participants on trade settlements, it is desirable that a central authority publish a daily index or set an accepted market convention on the methodology for calculating the daily unit of value. Simplicity of the methodology for calculating this daily measure is also important to promote secondary market activity.

For example, consider the Bolivian Unidad de Fomento de la Vivienda (UFV). It is a daily rate derived from the monthly CPI. The derivation is relatively complicated in that a monthly inflation rate is first calculated from the 12th root of the annual inflation rate. Then a daily rate is calculated by taking the nth root of the

monthly inflation rate, where n reflects the number of days in the month. The advantage of the UFV is that it is very smooth; however, this is potentially outweighed by the fact that the derivation is so complex that it is not well understood. It also does not offer full inflation protection in that it does not compensate for any unusually large peaks (or troughs) in the CPI, i.e., it is too smooth.

The bond documentation should also allow for changes in the composition of the index, methodological changes, and a possible replacement of the original index (in the event that it ceases to be published). This is important given that these bonds are likely to be of longer maturity. Again, best practices in the major index-linked markets allow for a switch to a replacement index (to be determined by an independent institution) in the event that the original index ceases to be compiled and published.[34]

A number of other factors may need to be considered, such as whether the bonds should contain a deflation clause or be strippable, as in the USA. Consultation with potential investors and market intermediaries should help weigh the relative merits of these various design choices.

Issuance mechanisms

As noted above, the liquidity of inflation-linked bonds tends to be less than that of nominal fixed-rate bonds. However, there are a number of choices that the issuer has with respect to the manner and quantity in which indexed bonds are issued that can help support liquidity in the market and manage the liquidity premium. These include: (i) a commitment to issue sufficient quantity of securities each year; (ii) choice of issuance technique; and (iii) frequency of issue.

When considering developing a market for inflation-linked securities, issuers need to consider the degree of commitment that they are prepared to give to that programme. Clear signals regarding likely issuance levels can help reduce the liquidity risk premium.[35] For example, France has committed to issuing at least 10 per cent of its gross issuance programme in linkers. Similarly, the UK committed (in 1998) to issuing a minimum quantity of £2.5 billion a year in inflation-linked bonds.[36] This commitment provides confidence to prospective investors that the market will endure.

The choice of issuance mechanism is also relevant for determining the risk premium on issue. When introducing new instruments, price discovery can be difficult in the absence of a benchmark. In addition, the availability of hedging tools influences how aggressive potential investors can be in their bids. For this reason, several issuers use syndication to launch the initial issue of a bond – France and Italy are examples – while others adopt the Dutch or uniform price auction as a way of reducing the 'winner's curse' where price discovery is poor – Japan, Canada and the UK are examples. South Africa has experimented with both uniform and bid-price auctions but recently announced (in October 2005) that it will switch to a uniform price format for inflation-linked bonds to reduce the 'winner's curse'.

Relatively frequent auctions can also enhance liquidity and aid price discovery, by providing a frequently tested measure of market appetite. Auctions provide a focal point around which activity can be concentrated. They represent an opportunity to

rebalance portfolios, providing incentives for investors with differing trading strategies to participate in the market.[37] For example, following a period of quarterly auctions, both Sweden and the UK moved to more frequent auctions. Sweden moved first to monthly auctions but now issues inflation-linked bonds twice a month. The UK, like France, tends to issue every month with the exception of August and December. This has had a beneficial effect on liquidity in the UK, with turnover in the inflation-linked market increasing more than that in the general market over the last three years (this was possible even without a significant increase in the proportion of issuance of inflation-linked bonds), 2.8 times to 1.6 times respectively. However, the level of liquidity in this market still lags that in the nominal fixed-rate market.

If auctions are used, given the experiences of other issuers, particularly those that have experimented with both formats (e.g., South Africa) issuers may like to consider a uniform price format. Issuers should also consider what, if any, price guidance they might give the market. They might also consider whether, particularly at the early stages of market development, a syndicated offer might be more readily absorbed by the market, if only for the first issue of any new bond. Again, new issuers could be guided by the experiences of others and seek to issue relatively frequently, at least in the early stages of market development.

Market support mechanisms

The role, if any, of market-makers in supporting secondary market activity is also important. For example, all primary dealers in France have an obligation to provide guaranteed liquidity in the secondary market in inflation-linked bonds; in the UK, however, only a subset of primary dealers have volunteered to act as market-makers in inflation-linked bonds. Their appetite to provide these services reflect the interest from their customer base.

Given the potentially limited capacity of any market-makers in the domestic market, the role of any support from the issuer, perhaps in the form of a secondary market window, should also be considered. For example, until very recently, the UK also provided a secondary market window to its market-makers, giving them a mechanism to lay-off their position with the Debt Management Office (DMO) at current market prices. However, liquidity in the market is now sufficiently great to support the removal of this facility. In a similar vein, Sweden provides its market-makers with access to an exchange facility for inflation-linked bonds, again at current prices.

Institutional prerequisites

The authorities also need to consider whether there are any legal restrictions on them issuing inflation-linked bonds. For example, both France and Germany had laws forbidding indexation that had to be modified.

Finally, the authorities need to consider the tax treatment of the accrued inflation on the principal. Many countries choose to tax the accrued inflation on an annual basis as income.[38] However, taxing income that has not yet been received reduces the attractiveness of these instruments. In general, taxation should be designed so that issuers and investors are tax neutral across the range of available instruments.

To realize the full cost benefits of inflation-linked bonds, the central bank should have clear objectives with respect to delivering price stability in the country and sufficient autonomy to meet those objectives. This enhances the credibility of monetary policy and increases the likelihood that such bonds will deliver cost savings. However, full central bank independence is not necessary.

Strategic issues

The experiences of both Peru and Mexico provide some guidance to prospective issuers that might wish to use inflation-linked instruments as a tool in developing the market for local currency fixed-rate instruments. Both countries clearly stated that their goal was to increase the proportion of domestic currency debt instruments in their debt portfolio and to gradually extend the maturity of fixed-rate instruments. By stating their commitment to developing the market for nominal fixed-rate bonds, the risk of promoting more widespread indexation has been avoided. Nevertheless, their gradual approach to the introduction of longer-dated fixed-rate bonds alongside inflation-linked bonds suggests a possible strategy outlined in Box 10.3.

In Peru's case, when the debt authorities began implementing their public strategy in 2003, they had already established a seven-year inflation-linked bond and a five-year fixed-rate bond. In the first year of the strategy, they continued to build-up the five-year segment of the fixed-rate curve while extending the maturity of inflation-linked bonds to ten years. The following year, they launched a new maturity in each market segment, a twenty-year inflation-linked bond and a seven-year fixed-rate bond. The existing inflation-linked bonds provided some

Box 10.3 Possible issuance strategy for inflation-indexed bonds

Assume that at the beginning, the longest fixed-rate instrument in local currency is a one-year bond.

- Year 1: Introduce a medium-term (five- or seven-year) inflation-linked bond; introduce a one-year or three-year fixed-rate bond. Further domestic currency issuance can then be accommodated in, say, three- or five-year FRNs depending on the amount to be financed and the broader strategic decision on currency composition.
- Year 2: Build up the medium-term inflation-linked bond. Towards the latter half of the year, introduce a longer-term inflation-linked bond (e.g., a ten-year). Continue to build the three-year fixed-rate bond; again towards the latter half of the year, introduce a medium-term fixed-rate bond (e.g., a five-year).
- Year 3: Continue to build the existing fixed-rate maturities, establishing benchmarks at the three- and five-year points of the curve. Towards the end of the year, consider introducing a ten-year fixed-rate bond. Continue issuing the ten-year inflation-linked bond. Consider whether demand continues to exist for the medium-term inflation-linked bond, if so continue to issue, otherwise introduce a new longer-dated (20- or 30-year) inflation-linked bond.
- Year 4: Extend the maturity of the inflation-linked sector further (to say 20 or 30 years); continue to build all existing fixed-rate and inflation-linked bonds. Introduce new benchmarks in the fixed-rate market where necessary. Consider whether conditions are right to launch a 20- or 30-year fixed-rate bond.

price information to the market for the new seven-year fixed-rate bond. In the latest year of the strategy (2005), they again issued a new maturity in each segment, first a 30-year inflation-linked bond and then a fifteen-year fixed-rate bond. Again, the existing twenty-year inflation-linked bond provided some basis for pricing the new fixed-rate maturity.

As an issuer would tend to issue inflation-linked bonds to extend the maturity of his domestic currency-denominated debt portfolio, this suggests that inflation-linked instruments should have a minimum maturity of five years. This is also likely to suit the potential investor base, particularly pension funds and insurance companies, that desire longer duration. However, where the banking system has extensive liabilities linked to inflation, it should have some interest in inflation-linked instruments at medium maturities. FRNs provide a natural instrument to meet demand at the shorter end, as these instruments provide a partial hedge against time deposits indexed to inflation.

10.8 Conclusion

This chapter has demonstrated the role that inflation-indexed debt can play as part of a well-managed government debt portfolio. It can act as a partial substitute for FX-denominated debt, thereby reducing a country's exposure to exchange rate shocks to levels that are more sustainable given the current account balance and anticipated revenue flows. It can offer some useful insurance against negative demand shocks given the positive correlation of debt service costs with tax revenues. It can enhance the credibility of a country's commitment to price stability, help bring about lower inflation in a cost effective manner, further the development of the domestic capital market by allowing a lengthening of the maturity of the debt portfolio and enhance the capacity of the domestic investor base by increasing demand from financial intermediaries and pension funds.

However, nominal fixed-rate debt also has a continuing and significant role to play in the debt portfolio. It provides some insurance against negative supply shocks and provides certainty of cash-flow costs that can be beneficial for budgetary planning purposes. Nominal bonds also tend to be more liquid, a benefit to both issuer and investor. The enhanced credibility of monetary policy that can result from issuance of inflation-indexed debt should reduce the general inflation risk premium and, consequently, the cost of extending the maturity of nominal debt. Hence, inflation-linked debt can provide a positive environment for issuing longer-term nominal debt, without requiring the issuer to pay the excess cost reflecting any lack of policy credibility.

Appendix 10.1 The UK experience

The UK issued its first inflation-linked bond in 1981. Initially, for tax reasons, ownership was restricted to companies involved in pension-related business. However, this restriction was lifted soon after. Index-linked issuance grew steadily with inflation-linked bonds representing 16 per cent of the total gilts portfolio by 1991; it now represents 25 per cent of total gilts outstanding (see Figure 10A1.1).

Steady efforts have been made to improve the market environment for inflation-linked issuance. In 1998, issuance moved to a regular schedule of auctions with secondary market liquidity supported by the establishment of a specialist list of market-makers (IG GEMMs). Up to that point, inflation-linked gilts had been issued through an ad hoc tap system. Along with the introduction of a preannounced calendar of auctions, the UK debt management authorities also gave a commitment to the market to issue a minimum of £2.5 billion each year and introduced a secondary market shop window for index-linked gilts, through which the IG GEMMs would be able to sell index-linked bonds to the DMO at a price of the DMO's choosing. These arrangements were designed to support the provision of liquidity to the market; the shop window was closed in 2001.

Since 1998, index-linked has made up a significant proportion of total issuance (see Table 10A1.1). This proportion dropped to 13 per cent in 2003–4; however, the £6.5 billion issued represented the largest absolute amount ever issued in one year by the UK. At the time, given concerns about market capacity, the DMO committed to limit index-linked sales to this amount. Experience, however, showed that the market had sufficient capacity and

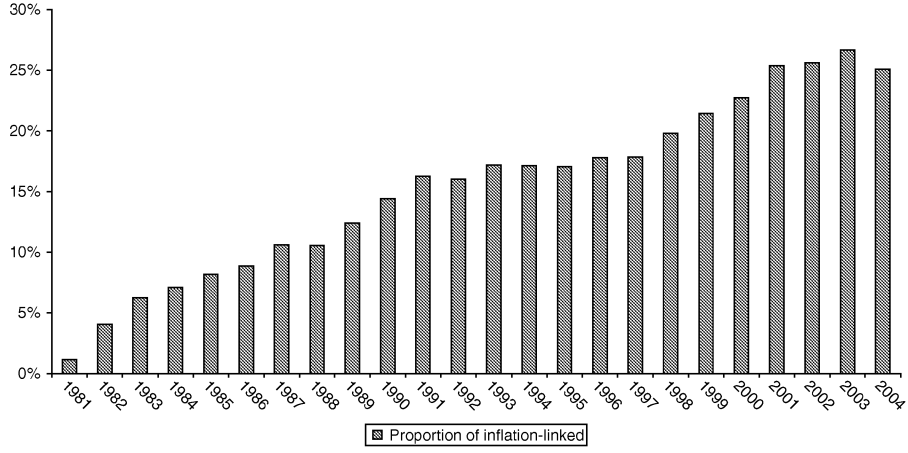

Figure 10A1.1 Proportion of inflation-linked bonds in portfolio

Source: UK Debt Management Office.

Table 10A1.1 Proportion of index-linked issuance

	Total index-linked sales (£bn)	Total gilt sales (£bn)	Proportion of index-linked sales
1998–9	2,553	8,150	31%
1999–00	3,113	14,375	22%
2000–1	3,487	10,017	35%
2001–2	3,597	13,656	26%
2002–3	4,562	26,275	17%
2003–4	6,511	49,854	13%
2004–5	7,995	50,102	16%
2005–6*	11,000	53,500	21%

Source: UK Debt Management Office.

* Planned issuance.

consequently the proportion of issuance has subsequently increased. In 2005–6, the commitment to supply a minimum of £2.5 billion was reviewed and replaced with an assumption that index-linked issuance will be consistent with approximately a quarter of the government's marketable debt portfolio being in the form of real exposure. The DMO is targeting £11.5 billion of index-linked gilt sales in 2005–6, 21 per cent of total planned gilt sales.

Non-government issuance followed and has been dominated by utility companies, private-finance infrastructure related issues and supermarkets. The non-government sector, however, is still only about one-tenth of the size of gilts issuance (see Table 10A1.2).

The potential scale of the cost savings that the UK has benefited from can be determined from an examination of the observed break-even inflation rates. Figures 10A1.2a and 10A1.2b show the break-even inflation rate for a representative five- and ten-year bond derived from the relevant yield curve[39] and the actual inflation experienced over the relevant period in the UK. This indicates the scale of the potential cost savings, which, particularly at the longer maturities, have been considerable but have clearly declined as the credibility of monetary policy has increased.

Using a relatively ad hoc approach to date policy credibility[40] suggests that prior to full credibility, the indicative cost saving would have been on average 138 basis points per annum (under both dating conventions); this declines to an average of about 25 (Bank

Table 10A1.2 Sterling inflation-linked issuance

	Sterling non-govt		Sterling govt		Total sterling
	($mn)	% of total	($mn)	% of total	($mn)
Dec 2000	3,072	3%	105,399	97%	108,471
Dec 2001	5,116	5%	104,845	95%	109,961
Dec 2002	9,803	7%	122,104	93%	131,907
Dec 2003	14,979	9%	149,061	91%	164,040
Dec 2004	19,711	10%	183,562	90%	203,273

Source: Barclays Global Inflation-linked Index.

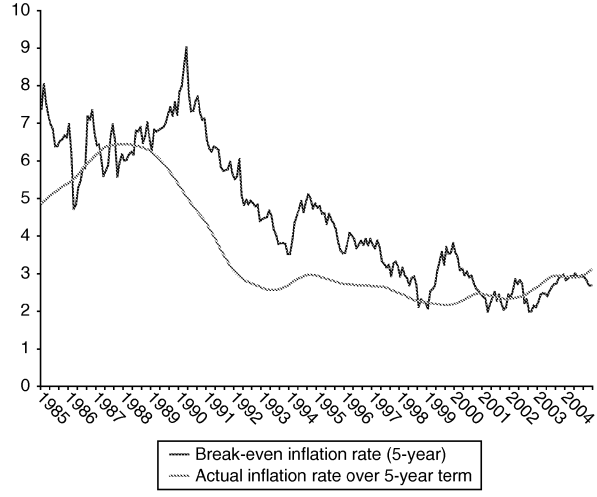

Figure 10A1.2a Five-year UK break-even inflation rate

Sources: Bank of England; Datastream.

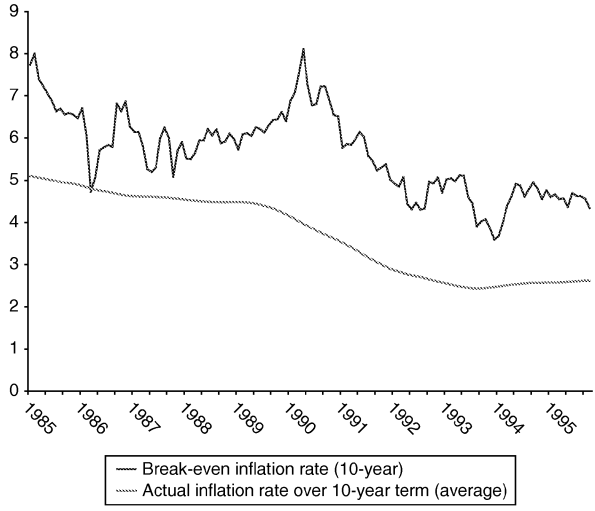

Figure 10A1.2b Ten-year UK break-even inflation rate

Sources: Bank of England; Datastream.

of England independence) or 35 (volatility approach) basis points per annum once full credibility has been achieved. At the ten-year point, the total indicative cost saving taking account of actual inflation is indicated to be around 200 basis points per annum; this is still in the pre-credibility phase regardless of dating convention.

Note that at the five-year maturity, the break-even rates have, at times, been negative. This probably reflects the relative liquidity of nominal and real bonds in the UK at this tenor given that the observed break-even inflation rates will also capture the relative liquidity premium. Reflecting the lower cost savings, the UK does not issue inflation-linked bonds with maturities of less than ten years. One required qualification here is that, because of the precise trading conventions in the UK, this measure will overstate the size of the risk premium when inflation is high and understate it when inflation is low.[41]

Appendix 10.2 Characteristics of major markets

The UK led the way for the G7 countries, issuing its first inflation-linked bond in 1981 (see Appendix 10.1). There were two principal reasons put forward for this decision: (i) issuing inflation-linked gilts should improve monetary control; and (ii) such bonds would eliminate the risk of inflation uncertainty for both the issuer and the investor, which should generate cost savings for the government.[42] There was an expectation that because of the positive impact on inflation expectations it would be possible to achieve a given monetary policy target at lower interest rates than would otherwise be necessary. In order to ensure that market participants had complete certainty about the next (nominal) coupon payment, an eight-month lag was chosen and the market convention has been to trade these bonds on a nominal price basis.[43] Within ten years, these bonds represented 16 per cent of the total marketable debt portfolio. Inflation-linked gilts now represent about 25 per cent of the total gilts portfolio and the UK is the second-largest market for inflation-linked securities in the world.

Canada was the next G7 country to enter the market in 1991 (see Table 10A2.1). The Canadians introduced an important innovation in instrument design – issuing real return bonds with a three-month lag in indexation and adopting a simplified price-yield calculation.

Table 10A2.1 Summary of key characteristics

Country	Year of first issue	Average inflation in preceding 3 years	Independent statistical agency	Active contractual savings market	Other comments
UK	1981	13.2	Yes	Yes	Initially sales restricted to pension funds, life insurance companies, etc.
Sweden	1994	5.4	Yes	Yes	Deflation floor present in its zero coupon inflation-linked bonds.
US	1997	2.8	Yes	Yes	Deflation floor included.
France	1998	1.7*	Yes	Yes	France issues two types of inflation-indexed bond: (i) indexed to domestic inflation; and (ii) indexed to inflation in the euro-zone. Deflation floor included. 1958 law forbidding indexation had to be revised and accounting treatment for insurance companies had to be revised.
Canada	1991	4.6	Yes	Yes	Market standard design – three-month indexation lag.
Italy	2003	2.2* 1.9**	Yes	Yes	Deflation floor included. Linked to euro-zone inflation.
Japan	2004	−0.6	Yes	Yes	Restricted to financial institutions and foreign governments.

Sources: Barclays Capital; Datastream.
* Domestic inflation.
** Euro-zone inflation.

This design has been adopted as the international standard and has been used by all other subsequent issuers. The UK has recently announced that all new inflation-linked issues will have this design from 2005 onwards.

In Sweden, the (re-)launch of inflation-linked issuance in 1992 was driven by a devaluation in the Swedish krona, which significantly increased the cost of FX debt.[44] This required the debt management authorities to find an alternative source of financing that would be of reasonable cost given that inflation expectations at the time were very high. Initially, issuance was in the form of zero coupon bonds, while coupon bonds following the Canadian model were introduced in 1996. In 1999, following the USA, Sweden introduced a deflation floor to its new issues.

The USA began issuing inflation-linked bonds in 1997, introducing two important adaptations to the design: (i) its inflation-linked bonds are strippable; and (ii) it introduced a deflation floor, i.e., it committed to pay investors on maturity the maximum of the inflation-uplifted principal or par. Index-linked issuance now accounts for about 4.5 per cent of US Treasuries outstanding. France and Italy, along with Sweden, have followed suit with respect to a deflation floor.

France moved into this market in 1998, initially launching the OATi, which is linked to French domestic inflation. At the time they considered linking to a measure of euro-zone inflation but that index was still in its early days of development and was, consequently, unstable and not well accepted. They introduced the OAT€i in 2001 which is linked to the euro-zone harmonized consumer price index (HICP), excluding tobacco. France originally hoped that the

OATi would be attractive to investors across the euro-zone, given the likely correlation between French inflation and inflation in the euro-zone; however, it was the launch of the OAT€i that really generated wide-ranging interest. Interestingly, instead of fragmenting the market, the existence of the two types of instruments has been mutually supportive.

Most recently, 2003 saw new issues from Italy – it had previously issued an inflation-linked bond in 1983 but did not continue at that stage with a programme – while 2004 saw Japan issue its first such bond. Here a more significant degree of inflation-linking in pension entitlements relative to many other countries will ensure interest in these instruments. Germany, the last remaining G7 issuer, is actively considering issuing inflation-linked bonds and has made the necessary legal provisions.

Other smaller issuers include South Africa, which first launched inflation-linked bonds in 2000 and cited cost savings and commitment to price stability as key factors determining their decision to issue, and Poland, which launched a twelve-year bond in 2004. Greece has also been active again, launching a 23-year bond in 2003, which it has subsequently re-opened.

By and large, with the exception of France, Italy and Greece, governments have chosen to issue inflation-linked bonds by auction rather than syndication.

Notes

1. We would like to thank Luis Oscar Herrera, Claudio Irigoyen, Augusto de la Torre and other participants at the April 2005 Lima conference for their helpful comments on an earlier draft of this chapter.
2. This excludes Brazil. Including Brazil, the numbers are 13 per cent and 23 per cent respectively.
3. The impact on sovereign credit ratings of excessive exchange rate exposure is discussed in Briozzo (2005).
4. This task is sometimes seen as virtually impossible to overcome, a situation dubbed, in the context of external debt, the 'original sin' (Eichengreen and Hausmann, 1999).
5. This is because issuers bear the costs of policy failure.
6. The global market grew by 31 per cent in 2002, 33 per cent in 2003 and 42 per cent in 2004.
7. See the Economics Progress Report issued by HM Treasury, May 1981, explaining the background to the Chancellor of the Exchequer's decision.
8. See 'Government to Issue Inflation-Linked Bonds', press release issued by Ministry of Finance, South Africa, 7 March 2000.
9. See 'New Emission of Bond (UDIS)', press release issued by the Secretaría de Hacienda y Crédito Público, Mexico, 22 May 1996, and 'Ten years with inflation-linked bonds – a new asset class has been established', speech by Swedish National Debt Office, 12 May 2004.
10. There had been a previous inflation-linked bond issued in 1952 but that was a one-off issue.
11. See 'New Emission of Bond (UDIS)', press release issued by the Secretaría de Hacienda y Crédito Público, Mexico, 22 May 1996.
12. Source IMF staff estimates.
13. The NTN-B is linked to the IPCA, the index of consumer prices.
14. Former UK Prime Minister; she was in office at the time that inflation-linked government bonds were introduced.
15. These residual risk factors would include political, legal, credit risk factors, which are likely to be the same for both nominal and real (inflation-linked) bonds, and liquidity risk, which may differ depending on the relative degree of development of the nominal and real markets.
16. See Armas and Grippa (Chapter 6 in this volume) for a fuller discussion of the Peruvian inflation experience.
17. Over 2004 the average break-even inflation rate at the 2008 tenor was 10 per cent, with a minimum of 7.9 per cent. Note the inflation-linked NTN-C is linked to the index of general prices, the IGP-M, not the IPCA, which is the relevant index for the authorities'

inflation target. The latest survey of market expectations (December 2004) suggests that IGP-M inflation is expected to be 6.5 per cent in 2005 and 5.5 per cent in 2006. Assuming that the market's expectations are met and that inflation is held at 5.5 per cent through 2008, then this suggests potential savings of the order of 215 basis points relative to the minimum break-even inflation rate of 7.9 per cent.

18. Note, over the five years prior to the introduction of inflation-linked gilts in January 1981, inflation in the UK averaged 14.5 per cent with a standard deviation of 4.4 per cent and stood at 15.1 per cent in December 1980.
19. Instrument design issues are discussed in more detail in Section 10.5.
20. A short lag will also be more attractive to potential investors as they will be concerned about any loss in inflation protection in periods of high and volatile inflation.
21. For clarification, it is important to focus here on truly exogenous shocks rather than endogenous shocks that should be subject to deterministic analysis. For emerging market countries this distinction is in practice not easy as exchange rate, interest and liquidity shocks are often, at least partly, the consequence of fiscal and debt management policies.
22. In contrast, the correlation with the exchange rate is usually very limited.
23. They also show that inflation-linked debt would be optimal even in the absence of any such covariance as inflation-linked debt provides the perfect hedge against an increase in the debt ratio due to lower than expected nominal output growth.
24. In particular, in the absence of binding capital controls.
25. This could happen due, for example, to Balassa-Samuelson effects.
26. As the UK experience has shown, this can be significant, particularly as expectations tend to be backward-looking.
27. This provides budgetary certainty, given that many of their outlays and revenues are likely to be nominal.
28. Fitzgerald (2005) identifies the fact that such instruments would lower the cost of inflation-indexed pension provision as a significant factor in favour of the introduction of Irish inflation-linked government bonds.
29. Box 10.2 discusses liquidity issues in more detail.
30. Note that the Mexican experience highlights the basis risk involved in taking on a CPI-linked mortgage while your income is indexed to earnings. However, this basis risk should still be lower than that on a dollar-linked mortgage.
31. This is fundamentally an identification problem. Attempting to combine nominal and real yields in this way would require making an assumption about the market's expectations of inflation that cannot be observed (as the maturity of nominal and inflation-linked bonds do not overlap) and may or may not hold. Combining the outcome of the assumption with actual market yields would require comparing bonds with different characteristics (actual vs. assumed expectations), violating the principle of yield curves.
32. In addition, if a trade-off needs to be made between an urban index, that is more reliable, and an overall index, the first may be preferable. It may also be more representative for the prospective class of purchasers – another positive.
33. Recall that the objective is to have an instrument whose return is correlated with changes in nominal output. Using the GDP deflator would stabilize the real return relative to real GDP.
34. See *Index-linked Re-design: Consultation Document* (UK DMO, 2002), for more discussion of this issue.
35. Sack and Elasser (2004) demonstrate that the relative supply of the instrument also has an impact on market liquidity.
36. This was one of a package of measures, which was intended to improve liquidity in the market. Other measures included moving to a transparent auction schedule and the introduction of market-makers with specific privileges that reflected the nature of liquidity in the market.

37. For example, passive fund managers will need to sell from their existing portfolios in order to make sufficient room to absorb the new supply, providing an opportunity for more active fund managers to easily acquire stock.
38. A notable exception is the UK where the compensation for inflation is not taxed.
39. Source: Bank of England.
40. Examining the five-year rolling volatility of inflation suggests that policy credibility was established in June 1996; alternatively, policy credibility is dated from the granting of monetary policy independence to the Bank of England in May 1997.
41. Because inflation-linked bonds trade on a nominal price basis in the UK market, an assumption about future inflation is required to derive the real yield. The convention is to use an expected inflation rate of 3 per cent. However, if true inflation expectations are in excess of 3 per cent (lower than 3 per cent), this will overstate (understate) the real yield and consequently understate (overstate) the break-even inflation rate.
42. Economics Progress Report issued by HM Treasury (May 1981) explaining the background to the Chancellor of the Exchequer's decision.
43. This requires the market to use a complex price/yield formula to back out the implied real yield. The implications of this are discussed further in Section 10.5.
44. There had been a previous inflation-linked bond issued in 1952 but that was a one-off issue.

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11
De-dollarizing the Hard Way

Daniel C. Hardy and Ceyla Pazarbasioglu[1]

11.1 Introduction

There is wide consensus that partial dollarization can magnify a country's vulnerabilities (e.g., Gulde *et al.*, 2004).[2,3] These vulnerabilities relate to the country's balance of payments, the banking sector and its borrowers and also fiscal sustainability. There is also broad consensus that dollarization is largely the product of macroeconomic instability or the threat thereof, which has led to a weakening of 'faith' in the national currency.[4] Hence, dollarization may increase the vulnerabilities of a country already prone to exogenous shocks or misguided policies. How vulnerabilities are affected depends on the form of dollarization. A distinction is usefully made between 'liability dollarization', where banks have liabilities to savers in the form of foreign currency deposits (FCDs); 'asset dollarization', whereby banks have extended credit to residents (including perhaps the government) in foreign currency; 'real dollarization', which implies that contracted amounts even for non-financial sector transactions are denominated in foreign currency, even if transactions are settled in local currency; and 'payments dollarization', under which payments are settled in foreign currency. Various combinations of these types of dollarization are possible, but 'liability dollarization' is probably the most common, and 'real' and 'payments' dollarization are viewed as more deep-seated forms of dollarization.

Partial dollarization may not only heighten vulnerabilities, but also brings with it other advantages and disadvantages (de Nicoló, Honohan and Ize, 2005; Ize, Chapter 2 in this volume). Nonetheless, most commentators and national governments view high dollarization as undesirable. Therefore, much of the academic literature concentrates on how to minimize the bad effects of dollarization, for example, by modifying prudential rules and adjusting the conduct of macroeconomic policy, and on how to wean the economy off dollarization (e.g., Ize and Powell, 2004; Herrera, 2004). Recommended policies for de-dollarization are designed to increase the relative attractiveness of the national currency, so that economic agents will voluntarily switch back to it. However, although highly dollarized countries, especially in Latin America, were able to bring down inflation and establish independent central banks and credibility, the success with de-dollarization has

been limited. It is recognized that voluntary de-dollarization is likely to be a drawn-out process because dollarization is characterized by hysteresis, that is, the process of dollarization creates new institutions and mechanisms and awareness, and it is not possible to go back to the status quo ante (e.g., Havrylyshyn and Beddies, 2003; Uribe, 1997).[5] The economy may reach a locally stable equilibrium characterized by a high degree of dollarization (Ize, Chapter 2 in this volume). Successful cases of gradual, voluntary de-dollarization are rare (Box 11.1).

Given the difficulties encountered in achieving gradual, voluntary de-dollarization, consideration may be given to using a more drastic and interventionist approach, namely the compulsory conversion of foreign currency denominated claims into

Box 11.1 Instances of gradual de-dollarization

Reinhart, Rogoff and Savastano (2003) identify Israel, Mexico, Pakistan and Poland as the only cases (among 86 countries) of large and persistent reversals of deposit dollarization (measured by the share of FCDs in total deposits) that had negligible effects on financial intermediation. Galindo and Leiderman (2003) identify Chile, Israel and Poland as successful countries. Pakistan is an instance of forced de-dollarization (explained in detail below). In all these countries, the de-dollarization strategy was part of a broader stabilization programme, which included introducing new assets with alternative forms of indexation (in the case of Israel and Chile) or high ex post real interest rates on local currency assets (Mexico and Poland).[1,2] Starting from levels of deposit dollarization above 50 per cent in the mid-1980s, deposit dollarization in Israel fell to less than 10 per cent by the mid-1990s after a decade of low and stable inflation and a backdrop of fiscal consolidation.

Egypt constitutes another successful case of gradual de-dollarization, where the share of FCDs in total deposits declined from 56 per cent in 1991 to 22 per cent in 1999 and, after remaining stable for a few years, further declined to 18 per cent by 2004.[3] Until the early 1990s, Egypt's banking system was characterized by interest rate controls, credit ceilings and differentiated reserve requirements (25 per cent on domestic currency liabilities and 15 per cent on FCDs). In early 1991, the authorities began a series of fiscal and monetary reforms designed to reduce inflation and enhance market forces in the allocation of credit. Bank lending and deposit rates were liberalized, credit ceilings on bank lending were removed, reserve requirements were reduced and unified across currency denominations.[4] The programme led to a number of positive effects: inflation declined sharply and real interest rates in domestic currency became positive. The share of FCDs declined as confidence in the reform programme increased.

1. See Bufman and Leiderman (1995) for the case of Israel and Chopra (1994) for Poland.
2. Ex ante real interest rates may have been lower insofar as probability was attached to the failure of the stabilization programme and a return to higher inflation. Local currency assets in some cases may have been depressed by regulatory restrictions prior to the stabilization programme.
3. Egypt is not identified in Reinhart, Rogoff and Savastano (2003) or in Galindo and Leiderman (2003), as the former uses a different definition of de-dollarization (FCDs over M2) and the latter uses a threshold of 20 per cent.
4. See Alexander, Baliño and Enoch (1995) and Handy (1998) and others. The reform programme also included introduction of prudential regulations for banks and strengthened bank supervision (see IMF, 2004a).

local currency. In this connection, one can ask such questions as

- What circumstances have led to forced de-dollarization?
- What are the costs of forced de-dollarization and how can they be minimized?
- When will forced de-dollarization achieve permanent de-dollarization and not be reversed once restrictions are lifted?

The chapter attempts to shed light on these issues. The chapter concentrates on the case where vulnerabilities have already been incarnated in a large adverse shock and, as a consequence, the authorities have required the 'pesoization' of some foreign currency-denominated assets or other obligations. Gradual, voluntary de-dollarization is no longer an option, so de-dollarization 'the hard way' is viewed as the best available policy. However, some consideration is also given to the possibility of forced de-dollarization in more normal times, even though, to the best of our knowledge, this has never been carried out in practice.

Since instances of forced de-dollarization are heterogeneous and limited in number, the main evidence comes from analysis of country case studies. In the next section, several instances are reviewed that can be characterized as failed forced de-dollarization, because the policy was quickly abandoned or because the economy soon re-dollarized. Other instances can be viewed as relative success cases because the economy recovered rapidly from the shock that occasioned the forced de-dollarization, and dollarization was reduced permanently. They are reviewed in Sections 11.3 and 11.4. Section 11.5 draws some lessons related to the questions posed above. Section 11.6 concludes.

11.2 Failed forced conversion experiences

By the early 1980s, chronic inflation and macroeconomic instability resulted in widespread dollarization of financial assets in both Bolivia and Peru, as private agents sought to protect their wealth from capital losses and were unwilling to save in assets with uncertain real returns. In November 1982, the Bolivian authorities de facto converted existing dollar deposits (which represented at the time 43 per cent of the broad monetary aggregate M2) into Bolivian pesos at the official exchange rate (Figure 11.1). The authorities also made it illegal to open new foreign currency bank accounts. Peru enacted similar measures to force conversion of FCDs into domestic currency in August 1985 (FCDs were about 58 per cent of total deposits a year earlier). In both cases, the imposition of foreign exchange controls was coupled with a large devaluation which effectively wiped out residents' wealth measured in dollars.

Following several years of extreme macroeconomic instability, however, both countries eventually allowed the opening of FCD accounts as domestic intermediation in local currency declined sharply and most deposits were channelled abroad.[6] Bolivia lifted restrictions on domestic FCDs in 1985 following the hyperinflation episode. A similar measure was adopted by Peruvian authorities in September 1988.[7] In both cases, these measures fostered a rapid re-dollarization of

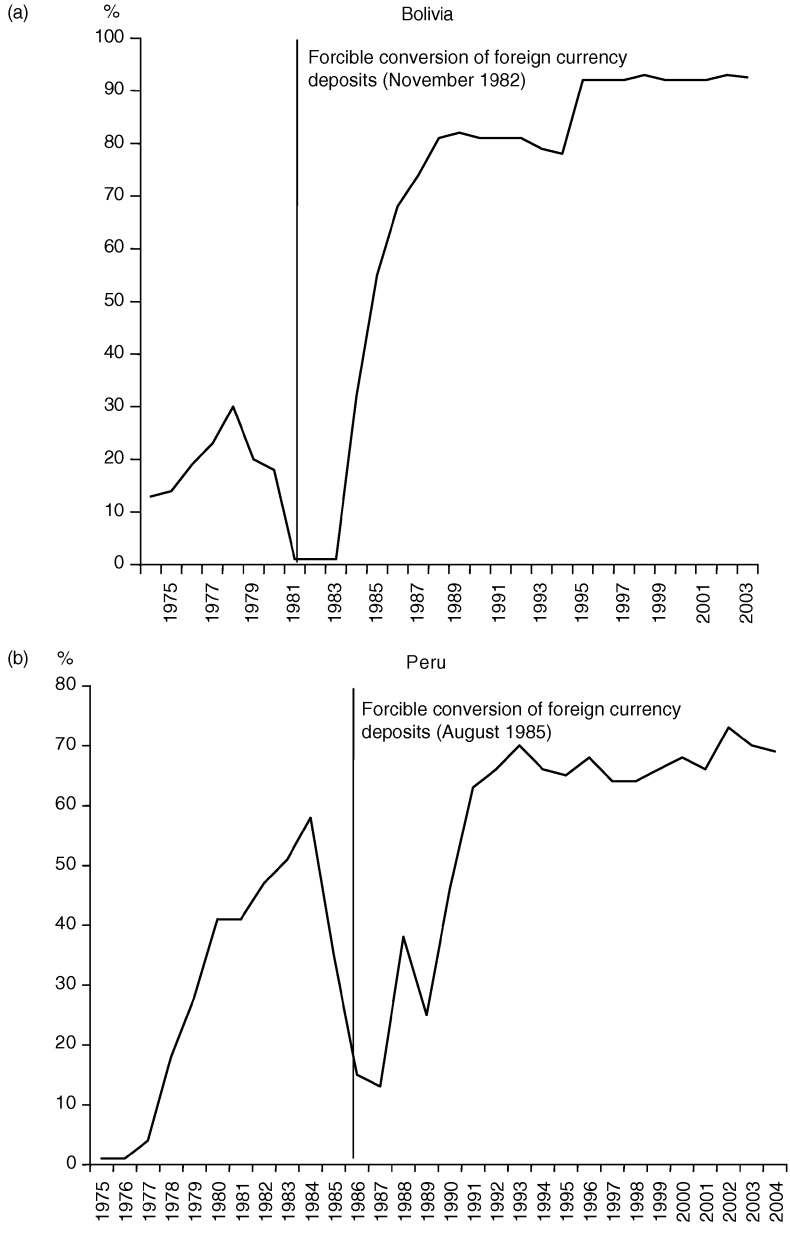


Figure 11.1 Bolivia and Peru: share of foreign currency deposits, 1975–2004 (in per cent)
Sources: Money and Banking Database (MTBS), World Economic Outlook (WEO) and Savastano (1992).

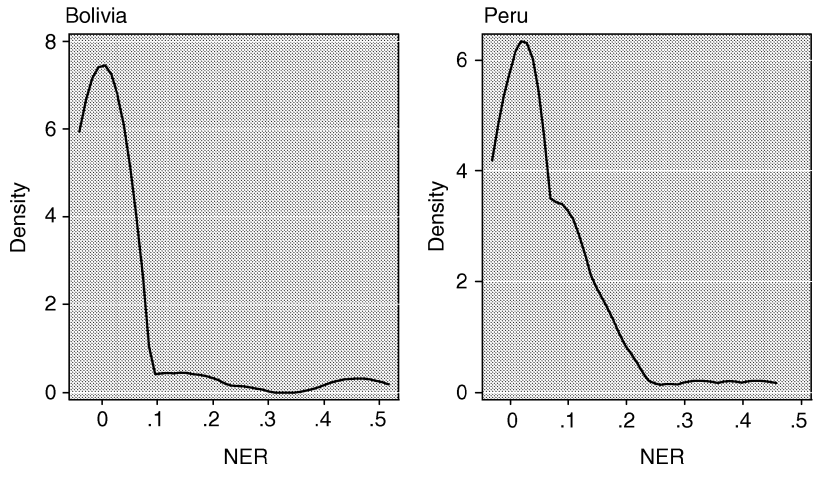
the economy, which has persisted until today despite the significant reduction in inflation.

Several lessons can be drawn from Peru's and Bolivia's unsuccessful experiences in combating dollarization. First, measures that attempt to reduce dollarization de facto without addressing the root causes of the private sector's currency preferences are bound to fail (Box 11.2). FCDs held by residents in these countries reflected their attempt to save in a unit of account that had a stable and predictable purchasing power, i.e., that insured them against inflation risk. In the cases of Peru and Bolivia, however, the underlying conditions that led to dollarization in the first place – monetary instability caused by the lack of institutions that promoted monetary credibility and fiscal consolidation – were not eliminated. Thus, the banking system rapidly became re-dollarized once FCDs were re-allowed.[8]

Box 11.2 Exchange rate changes and incentives for dollarization

An analysis of the historical distribution profile of exchange rate changes may provide some insights regarding the incentives for deposit dollarization. As shown in the figures below, in the cases of Bolivia and Peru the likelihood of large depreciations of the currency was substantially greater than that of large appreciations. This may have fuelled the perception of dollar deposits as a 'one-sided bet', providing strong incentives to save in foreign currency assets.

Period: pre-forced conversion



Note: The figures plot the kernel density estimates of quarterly percentage changes in the nominal exchange rate for Bolivia and Peru. The univariate kernel density estimation is performed using an Epanechnikov kernel. The sample period extends from 1970 until the last quarter before the forced conversion in each country. The return series in both countries during this period shows substantial excess kurtosis and positive skewness, indicating right fat tails and lack of symmetry.

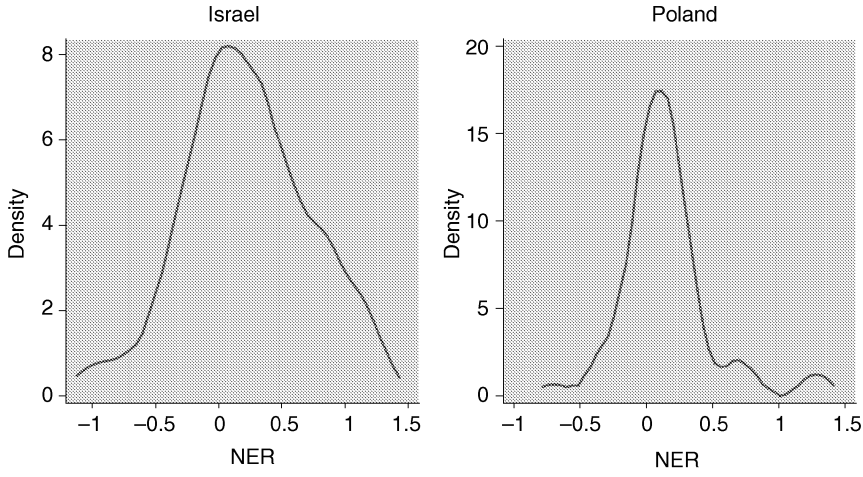
Continued

Box 11.2 Continued

This analysis underscores the notion that achieving de-dollarization is bound to be a protracted process; the distribution profile of exchange rate changes varies only gradually as part of a cumulative process. It follows, then, that any abrupt plan to repress the use of the dollar (like the forced conversions in Peru and Bolivia) are likely to fail, to the extent that they do not address the underlying reasons for agents' currency preferences.

FD remained high in both Bolivia and Peru, even after success in controlling inflation, although dollarization has been declining in recent years. On the other hand, Israel and Poland were able to achieve a sustained reduction in deposit dollarization following the stabilization of their economies. Ize and Levy Yeyati (2003) use a portfolio analysis that explains this puzzle by highlighting the stochastic behaviour of prices and exchange rates as the main factors driving the hedging decisions of risk-averse households. We extend the analysis of the distribution of exchange rate variations to explain the different experiences of Bolivia, Peru, Israel and Poland (see figures below).

Patterns of exchange rate fluctuations in Israel and Poland, countries that were able to reduce dollarization, suggest a two-way exchange rate risk as well as lower probability of sharp changes in the exchange rate.



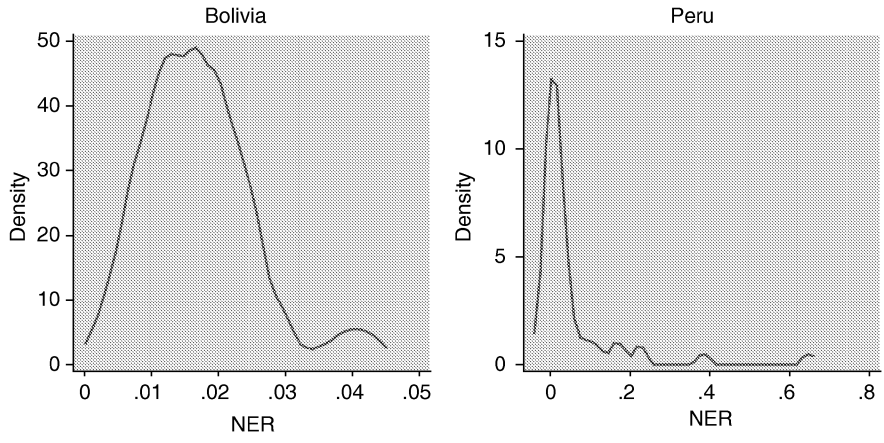
Period: 1990–2004

In contrast, in Bolivia, exchange rate fluctuations have been predominantly in the form of local currency depreciations. This evidence likely reinforces the perception that the exchange rate is ultimately flexible in only one direction, favouring dollar over peso savings.

In the case of Peru, return series suggest a high relative likelihood of a breakdown in the exchange rate system (i.e., a large-scale devaluation). This implies that agents would demand a higher risk premium on peso deposits. Agents that are averse to sudden capital losses would prefer dollar assets, providing some explanation for the persistence of high dollarization despite the decline in the level and relative volatility of inflation and the existence of inflation-linked instruments.

Continued

Period: 1990–2004



The empirical evidence suggests that greater exchange rate flexibility may act as a deterrent to FD by introducing a two-way exchange rate risk. This would alter the relative risks in favour of the domestic currency, by eliminating the 'one-sided bet' that pegged rates or narrow band regimes often provide.

A second lesson that can be drawn from Bolivia's and Peru's experiences is that dollarization is typically so ingrained, that attempts to reduce it overnight may induce massive disintermediation and capital flight. Dollarization is a form of contractual adaptation and its reversal requires a certain period of time whereby agents revise their expectations on price risk and adjust their savings portfolio accordingly.

Third, attempts to overcome dollarization by dishonouring the terms of financial contracts (as was the case in Peru and Bolivia) are likely to have long-lasting effects on domestic financial intermediation, even if FCDs are later re-authorized. As noted by Baliño, Bennett and Borensztein (1999), forced conversions entail a substantial loss of government credibility, increasing the confiscation risk perceived by domestic residents. In the case of Bolivia, for example, after FCDs were reintroduced, the spread over LIBOR on domestic dollar deposits – which reached over 900 basis points in 1987 – was still over 400 points at the end of 1996. However, it is hard to separate the impact of the forced conversion from the loss of confidence in the local currency following the hyperinflation.

Fourth, attempts to reduce dollarization by banning completely the use of the dollar will not actually increase the resilience of the economy, especially in small open countries. Foreign currency assets become a natural hedge to inflation risk in the case of pass-through from exchange rate movements to prices. Thus, a certain level of dollarization is not only unavoidable, but also desirable to mitigate the currency risk in the economy (especially for those agents whose income is denominated or indexed to the dollar).

Finally, de-dollarization strategies often usefully include measures supportive of a reintermediation in local currency such as the introduction of savings instruments whose return is indexed to inflation in the domestic currency (Holland and Mulder, Chapter 10 of this volume). Measures to nurture the domestic currency as a store of value were lacking in the forced de-dollarization episodes of Bolivia and Peru during the 1980s.[9]

11.3 Pakistan: policy-induced dollarization and reversal

Pakistan's experience with dollarization over the past two decades illustrates the role that both macro- and microeconomic policy can play in inducing dollarization and then reversing it. It also provides an example of the forced de-dollarization of deposits, where lending to the private sector was not heavily dollarized, and of how de-dollarization can become part of a virtuous circle of stabilization and increased confidence.

Policy-induced dollarization

Pakistan's economic development during the 1970s and 1980s was widely perceived to be impeded by the country's balance of payment's constraint, even while the country was able to accumulate a substantial stock of foreign debt. At the same time, the domestic financial system was centrally directed subsequent to the nationalization of domestic banks in 1972; interest rates were set administratively, and credit was allocated according to a complex development plan. The country also suffered several bouts of political and economic instability. Faced with these uncertainties and poor financial returns in Pakistan, capital flight became substantial. Moreover, large numbers of Pakistanis emigrated, notably to the Gulf states following the 1973 oil boom; the emigrants remitted funds, but also accumulated assets abroad.

The authorities sought to tap the emigrant community for funding by allowing the opening of non-resident FCDs, first in 1973 (Husain, 2003). No questions were asked about the source of funds, and returns were tax-free. Funds could be freely withdrawn to make foreign payments. Inflows started slowly, but built up over the course of the decade (Mirakhor and Zaidi, 2004). However, domestic lending in foreign currency was not permitted; the inflow of FCDs was effectively used as a contribution to official international reserves.

Starting in late 1988, the authorities launched a general reform programme for the financial system: entry by domestic private banks was permitted; foreign banks were allowed to compete in more lines of business; some state-owned banks were privatized; prudential regulations were tightened and better enforced; interest rates and credit allocation were liberalized; and market-based government bills and bonds were introduced (see State Bank of Pakistan, *Financial Sector Assessment*, various issues). With some interruptions, the process has been maintained until the present, when the Pakistani financial system is considered to be relatively sophisticated, profitable and efficient (IMF, 2004b; see also Bonacorsi di Patti and Hardy [2005] on the history of reforms and the effects on the banking system).

Concurrent with the financial liberalization process, residents were allowed to open FCDs in 1991 under the same favourable conditions as applied to non-resident FCDs. The authorities seem to have been motivated mainly by their continued concern to build up international reserves or service foreign debt. Although foreign debt and debt servicing were rising, there was little concern at the time about longer-term sustainability.

FCDs rapidly gained in popularity, and the non-resident FCDs also began to grow. FCDs contributed a large proportion of the monetary growth witnessed in the mid-1990s (Figures 11.2 and 11.3). One main source of the inflows was

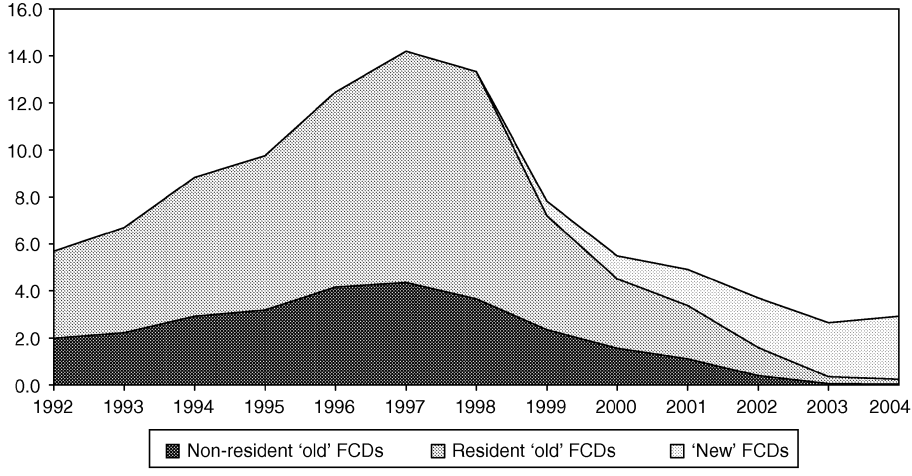


Figure 11.2 Pakistan: stock of FCDs (in $billions)

Source: State Bank of Pakistan, IFS and staff estimates.

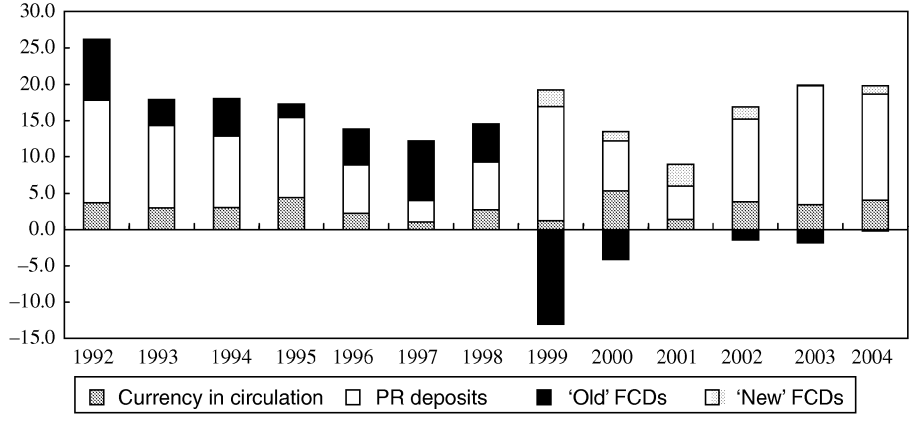


Figure 11.3 Pakistan: contributions to broad money growth (annual change in per cent of beginning of period broad money)

Source: State Bank of Pakistan, IFS and staff estimates.

remittances, and therefore the increase in FCDs was closely linked to earnings of expatriate Pakistanis working in the Gulf, which fluctuated with demand for their services (Hyder, 2003). The availability of remunerated, relatively safe FCDs and improved banking services led to a shift away from the use of informal remittance systems (known as Hindi systems), but in many cases transactions may have gone through the active kerb market. Although data are not available, placement in FCDs may also have been viewed as a substitute for capital flight and the retention of savings in foreign currency cash. Partly as a result, recorded remittance inflows remained broadly stable through the 1990s despite the decline in oil prices and consequent decline in earnings by Pakistanis in the Gulf, and greatly eased the balance of payments constraint facing the country (Figure 11.4; see Mirakhor and Zaidi, 2004).

Depositors were attracted to the FCDs (primarily denominated in US dollars) because they offered a 'safe haven' against domestic inflation and other shocks, while also yielding a relatively high return and facilitating the making of foreign payments.[10] More specifically, the return on FCDs was linked to LIBOR, while returns on Pakistani rupee (PR) deposits were at or below the State Bank of Pakistan (SBP) discount rate and moved broadly in line with it. The SBP discount rate was often 10 percentage points or more above LIBOR, but the PR often suffered large step depreciations. Therefore, the total, after-tax and risk-adjusted return on FCDs was very favourable, especially for those whose consumption basket contained many imported items (Figure 11.5).

Banks were eager to acquire FCDs, which offered them high returns for little or no exchange rate risk: except for a limited amount of trade financing, banks were not allowed to lend domestically in foreign currency, and had to sell foreign currency acquired through FCDs to the SBP. Banks could use the rupees acquired

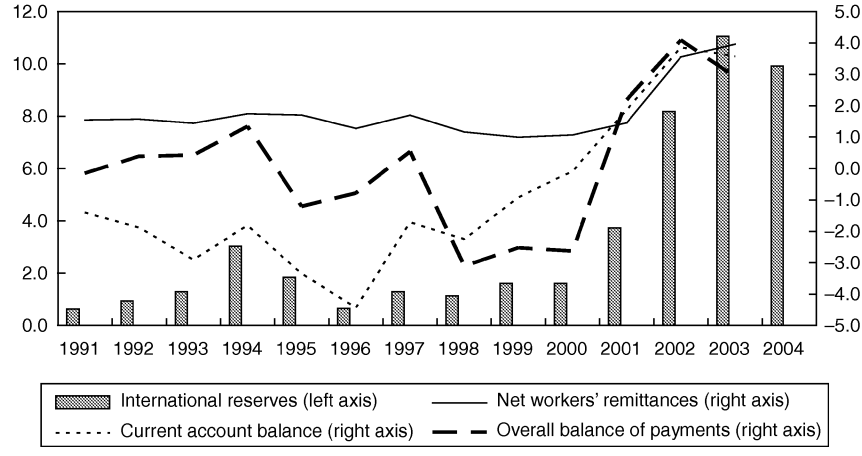


Figure 11.4 Pakistan: balance of payments and international reserves (in $billions)
Source: State Bank of Pakistan, IFS and staff estimates.

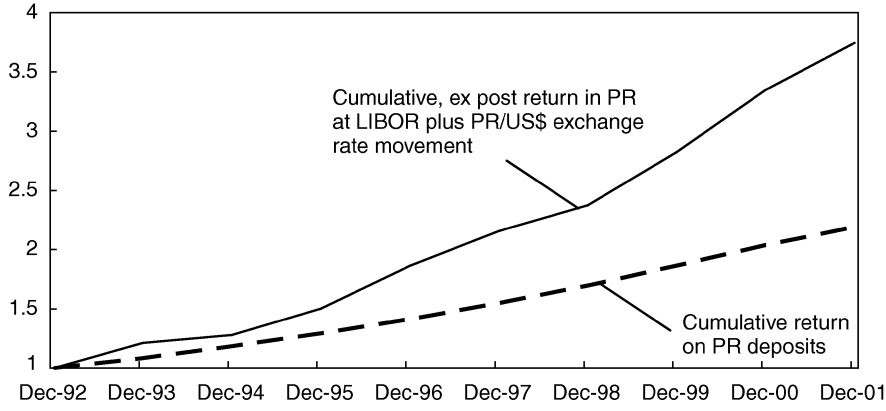


Figure 11.5 Pakistan: cumulative returns on local and foreign currency assets (in local currency, December 1992 = 1)

Source: State Bank of Pakistan, IFS and staff estimates.

this way to acquire high-yielding local-currency assets, such as the newly introduced Treasury bills.[11] Banks could keep a closed foreign currency position on account of the forward foreign currency cover provided by the SBP: the SBP committed itself to providing forward foreign exchange cover at an administered price. While the forward premium varied and gradually increased in the course of the 1990s, it was consistently less than the ex post rate of depreciation of the PR. Hence, the Central Bank essentially subsidized the mobilization of FCDs. Furthermore, in 1986, the SBP started offering banks a dollar deposit facility yielding 17 per cent, which was far above what they could obtain on correspondent accounts abroad. The foreign banks, which lacked large branch networks with which to mobilize retail PR deposits, were especially active in attracting FCDs.

In addition, several forms of foreign currency bearer certificates were introduced over time. The bearer certificates could be bought for cash with no questions asked about the source of the funds and were tax-free. They were intended to attract flight capital and funds kept in foreign currency cash as a store of value and to evade taxes. However, the volume of foreign currency bearer certificates was small relative to the stock of FCDs or of government debt generally.[12]

FCD freeze and de-dollarization

The situation changed abruptly when, in late May 1998, Pakistan tested a nuclear bomb, which provoked a shut-down in access to international debt markets and funding from international financial institutions. Pakistan was also made subject to sanctions. This political shock led to a rapid outflow of foreign exchange reserves, including through withdrawal of FCDs (which reached a peak shortly before the onset of the crisis), the drying-up of capital inflows and remittances and pressure on the exchange rate.[13]

In response, the authorities took a number of emergency measures, including the freezing of FCDs and the reimposition of various exchange controls.[14] However, after a short period, the authorities allowed frozen FCDs to be withdrawn in rupees, at the official exchange rate, which was much less favourable than the market rate.[15] In due course, the authorities also offered to convert FCDs into medium-term dollar-denominated bonds, with a coupon set a few percentage points above LIBOR.[16] Nonetheless, newly deposited foreign currency remained free of restrictions on withdrawals and also on interest yield, but was no longer tax-exempt. The forward cover scheme for banks was discontinued and instead the SBP imposed a special reserve requirement on FCDs. The SBP also disallowed the use of FCDs as collateral.

Since then, conditions have normalized. The SBP has been dismantling exchange controls and restrictions on the foreign currency operations of banks. Meanwhile, access to international capital markets was regained and relations with international financial institutions restored (IMF, 2004c; see also Lorie and Iqbal, 2005). Macroeconomic performance improved: real growth rates have picked up to about 6 per cent; inflation has fallen to the 3–4 per cent range (from around 10 per cent during much of the 1990s); the current account has swung into surplus; the ratio of international reserves to short-term external debt has risen from a low of 25 per cent to over 250 per cent (see also Figure 11.4); and the budget deficit has fallen from over 4 per cent of GDP to under 2 per cent. Domestic financial markets, such as the Karachi stock exchange and the market for real estate, have enjoyed something of a boom.

The stock of old FCDs eroded as depositors took out funds in deposits or bonds (Figures 11.2 and 11.3). A significant stock of new, unrestricted FCDs was built up, but never represented a large share of total deposits; demand for rupee deposits has been growing rapidly. Today, FCDs constitute a relatively minor part of investors' assets. The financial system as a whole is on a sounder footing and offers a wide range of products.

The sustained decline in deposit dollarization can be attributable to a number of factors:

- Investors' demand for dollar assets was discouraged. By introducing a freeze on the withdrawal of deposits in dollars, but allowing withdrawals in PRs, FCDs lost their 'safe haven' status. This might have discouraged some remittances from passing through the formal financial system (remittances dropped sharply in 1999–2001), but the overall flow of remittances recovered subsequent to the crisis, largely because of increased demand for Pakistani expatriate labour in the Gulf region as the oil price recovered. Local currency investments (for example, in the stock and housing markets and the new, relatively liquid government securities, but also regular bank accounts) started offering better overall returns than FCDs.
- Banks' incentives to mobilize FCDs were reduced. Schemes favourable to FCDs were terminated and various regulatory means, such as higher reserve requirements, were introduced to promote de-dollarization. Financial sector reforms also opened up alternative, lucrative local currency markets for banks.

However, the SBP absorbed much of the exchange rate risk. Neither during the period of dollarization nor thereafter did banks take large foreign currency positions. Nor did corporates or households have significant liabilities denominated in dollars. Hence, de-dollarization was not complicated by a deterioration in bank soundness.

- There was little hysteresis in dollarization because dollar lending and 'real' dollarization of contracts and transactions in the domestic economy were not widespread. First, the FCDs did not give rise to a multiplicative creation of foreign currency money because foreign currency lending was not permitted. Second, the institutional arrangements for the dollarization of transactions and contracts were not already in place. De-dollarization did not involve the abandonment of a payment system based on the use of dollars or the wholesale rewriting of contracts denominated in dollars. Third, the disruption in the relationship between foreign currency depositors and banks and the subsequent decline in FCDs affected the SBP because of the forward cover scheme, but did not affect borrowers. Indeed, the direct effect on borrowers of the freeze on FCDs and the concurrent depreciation was slight; they endured higher interest rates and restrictions on trade financing, but they did not suffer a large capital loss.
- The foreign exchange crisis was caused by a political security crisis, rather than a purely economic shock or a failure of economic policy. The crisis was predominantly one of liquidity rather than solvency. Hence, confidence in the national currency and the national economy was not fundamentally undermined. The fact that banks, depositors and bearer bond holders suffered no large losses on a cash basis in the process helped underpin general confidence.[17]
- The achievement of macroeconomic stabilization was a precondition for de-dollarization. While there was feedback from de-dollarization and the concomitant shift in demand back to PR deposits to macroeconomic stabilization, causation ran primarily from the control of monetary expansion, fiscal consolidation, better debt management and structural reforms to lower demand for foreign currency assets. Furthermore, the improvement in the balance of payments (and the development of cheaper domestic sources of government financing) meant that the authorities had less temptation to reintroduce incentives to attract FCDs from Pakistanis abroad.

11.4 Argentina: crisis-induced de-dollarization

After a history of recurring financial crises throughout the 1970s and 1980s, Argentina went through its deepest crisis in early 2000 culminating in the abolishment of the decade-long currency board and debt default.[18] The deposits of the banking sector were rescheduled and bank balance sheets were de-dollarized at asymmetric rates (Arg$1 per dollar on the asset side and Arg$1.4 per dollar on the liability side). Calvo (2002) stresses the sudden reversal of capital flows to Latin America in the late 1990s and distinguishes the ability of different Latin American countries to cope with the reversal depending on the degree of openness of the country and the extent of liability dollarization. He argues that being a closed

economy with a very high degree of liability dollarization, Argentina had to experience a very large change in the real exchange rate to eliminate the current account deficit.

Following implementation of the Convertibility Law and the restoration of macroeconomic stability in 1991, Argentina's financial sector underwent a significant transformation. Banking system efficiency improved markedly through substantial consolidation, privatization and increased entry of foreign institutions. By the end of the decade, the banking sector was composed of half as many institutions as in 1995 and there was significant private sector ownership and a strong foreign presence. Financial deepening, measured by the ratio of M3 to GDP, increased from 5 per cent in 1990 to 30 per cent in 2000. Banking system assets almost doubled during the period, increasing from about 30 per cent to 57 per cent of GDP. The credit to the private sector increased 10 per cent per year peaking at 23 per cent of GDP in 1998. The financial system emerging from this structural transformation was relatively well capitalized.

However, the banking system had become heavily dollarized, making it very vulnerable to the elimination of the hard peg; more than 80 per cent of credits to both the private and public sector and close to 85 per cent of deposits were denominated in foreign currency (Figure 11.6). Although the banks did not have a currency mismatch, they were subject to credit risk as most lending in foreign exchange was to borrowers with local currency income (due to the government's convertibility promise).

Under the Convertibility Law, the regulators did not impose prudential rules to differentiate between Argentinian peso vs. US dollar exposures, thus fostering the dollarization of the financial intermediation. As noted in Daseking *et al.* (2004) when doubts about the peg encourage holdings of dollar deposits, households and firms may still have an incentive to borrow in dollars, if they expect to be bailed

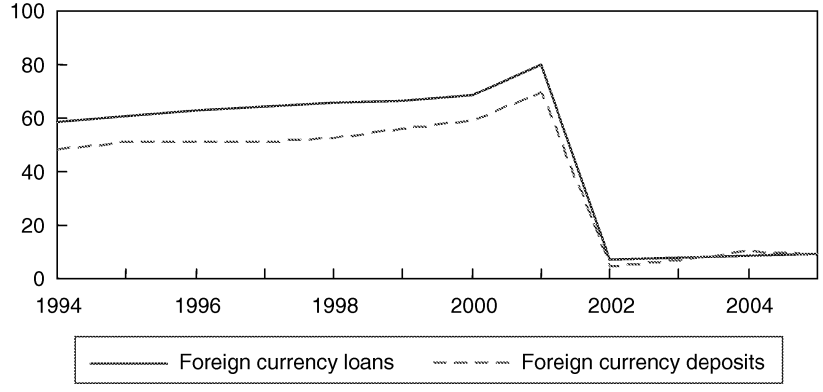


Figure 11.6 Argentina: share of foreign currency loans and deposits, 1994–2004[1] (in per cent)

Source: BCRA.

1. 2005 data through June.

out (or simply default) in the event of a large devaluation. Ex post, borrowers seem to have anticipated government intervention to limit their exposure in the event of a devaluation (as indeed happened as a result of the asymmetric pesoization).

The prolonged economic recession combined with slippages in fiscal policy and political instability led to capital flight. The authorities' policy response (including a financial transactions tax and changes in the decade-old convertibility plan) exacerbated these concerns. Following the deposit runs, the authorities announced a series of restrictions on the cash withdrawals of deposits (the 'corralito') in December 2001 (Figure 11.7). The measures included (i) a Arg$250 per week limit on deposit withdrawals per bank account; (ii) limits on bank transactions to payment by cheques, credit and debit cards and interbank transfers; (iii) gradual dollarization of banks' assets by only allowing the rollover of peso loans into dollar loans; and (iv) prohibition of transfers of funds abroad without prior Central Bank approval.

Although the prudential regulations put in place during the 1990s should have been sufficient to protect banks from most risks, they were unable to counter the impact of the extraordinary events that took place after the collapse of the currency board arrangement in 2002. On 21 December 2001 the Argentinian government declared a bank holiday and restricted the withdrawal of deposits. It then forced an asymmetric conversion of deposits and loans at exchange rates that were lower than market rates. This resulted in large losses for depositors and large windfall gains for corporate and household borrowers. The asymmetric conversion of

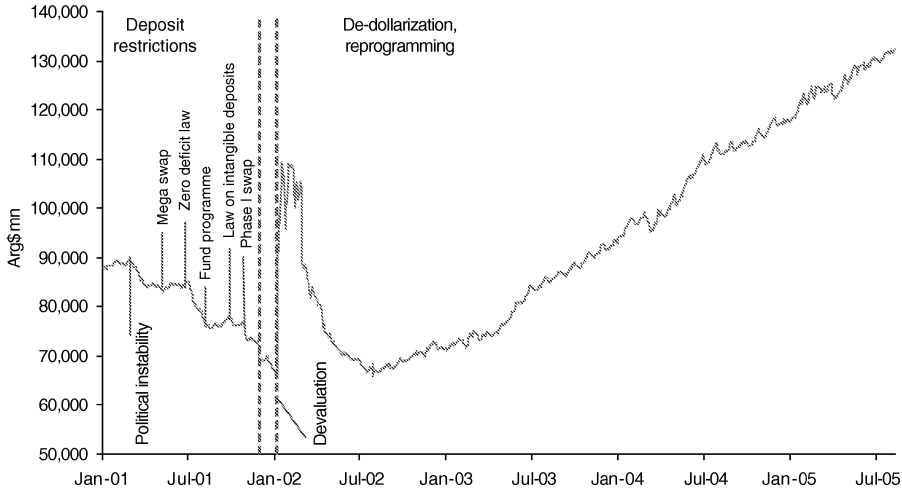


Figure 11.7 Argentina: total banking system deposits, 2001–5[1] (public and private, local and foreign currency)

Source: BCRA.

1. Foreign currency deposits for 2002 converted at market exchange rates (Bloomberg).

deposits and loans led to a hole in bank balance sheets which was then compensated by government bonds; however, the large gap between the market and book value of the compensation bonds (Bodens) implied a significant loss for the banks.

In the second half of 2002, deposit outflows reversed and the deposit base began to grow. This turnaround reflected the combined impact of exchange rate stability, high domestic interest rates and effective full protection of depositors in case of bank closures. In the face of this stability, the authorities began easing deposit restrictions and in December 2002, the authorities announced the lifting of all restrictions on the withdrawal of sight deposits.

By end-June 2005, bank deposits, in real terms, are 20 per cent higher than pre-crisis levels (Figure 11.8). However, the restructuring of deposits (for the third time in Argentinian history) has eroded credibility, and households and institutions have not been saving through the domestic banking system. The recovery in deposits is mainly due to the increase in public deposits and in sight deposits for transaction purposes. Private sector deposits are still 15 per cent below their December 2001 level; FCDs have been increasing slowly and account for 8.5 per cent of total deposits as of June 2005 (Figure 11.9).

Although credit has been growing briskly in 2004–5, credit to GDP remains low at about 10 per cent of GDP compared with 25 per cent before the crisis (Figure 11.10). In 2004, the total loans to the private sector increased by about 25 per cent, mainly in terms of short-term commercial (overdrafts and promissory notes) and consumer loans. Foreign currency loans are 9.5 per cent of total loans as of June 2005. According to regulations imposed after the crisis, banks can only

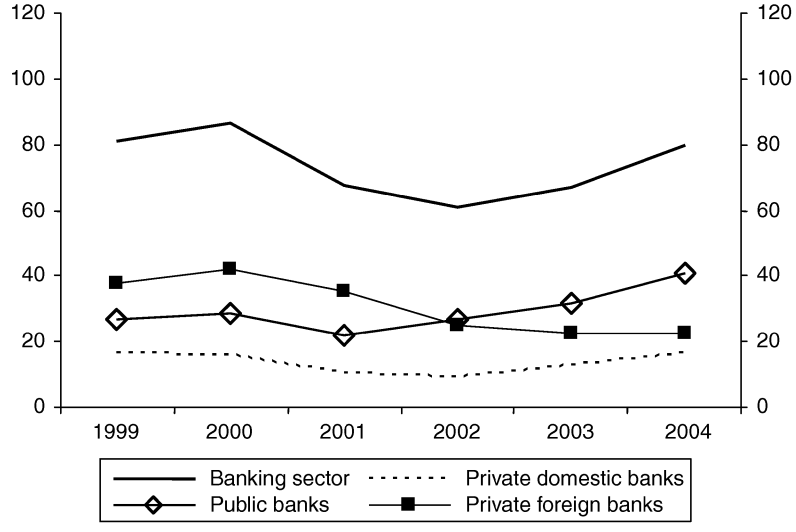


Figure 11.8 Argentina: total bank deposits (in billions of constant 1999 Argentinian pesos)
Source: BCRA.

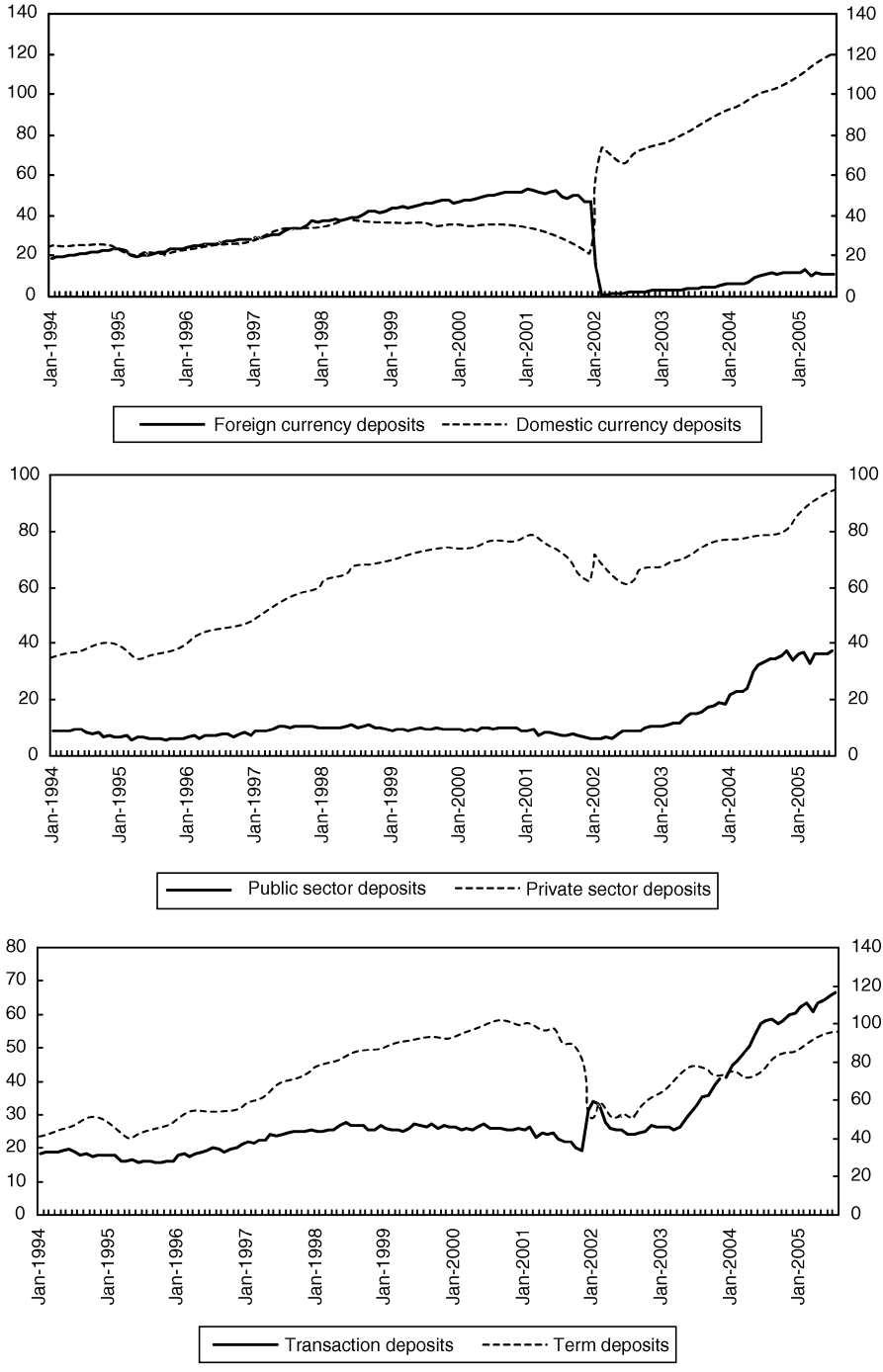


Figure 11.9 Argentina: bank deposits, 1994–2005 (in billions of Argentinian pesos)
Source: BCRA.

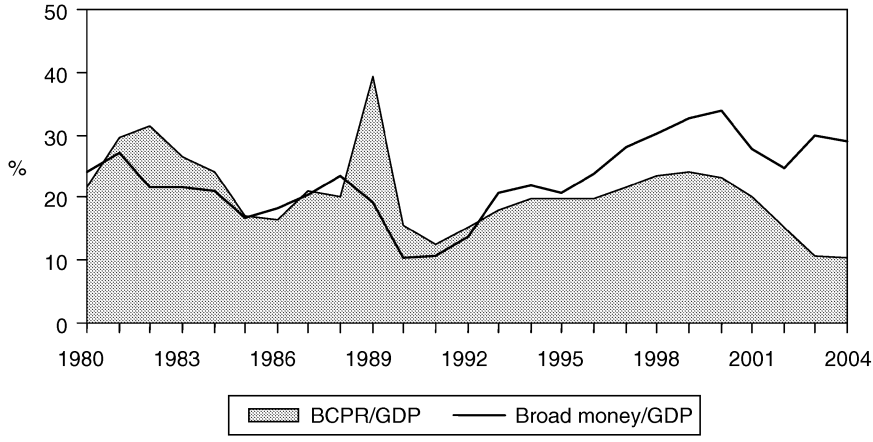


Figure 11.10 Argentina: financial intermediation and financial deepening (in per cent of GDP)
Source: BCRA.

lend in foreign currency to exporters or to borrowers that have an income denominated in foreign currency.

The sustained decline in deposit and credit dollarization can be attributable to a number of factors:

- By avoiding major price instability following the crisis, Argentina was able to restore the function of the peso as a means of payment and store of value. The country experienced a strong recovery following the disorderly exit of the convertibility regime at the end of 2001, and has concluded the largest sovereign debt restructuring in recent history.
- The implementation of prudent macroeconomic policies has been the main factor behind the return of confidence. In addition, a positive international economic environment supported the recovery and public finances through high commodity prices. Domestic interest rates remained low and the peso nominal exchange rate remained broadly constant against the dollar through central bank interventions.
- Through limits on the extension of dollar credits, the authorities have been trying to promote the peso as the currency for financial intermediation. Thus, banks have little incentive to mobilize dollar deposits as these can only be on-lent to exporters or borrowers with foreign currency income. On the other hand, there has been limited demand for loans from exporters as the sector is enjoying cash-rich positions due to high commodity prices.

Although the banking system has been gradually recovering due to the extension of regulatory forbearance, it mainly functions as a narrow banking system focused largely on payments and very short-term financial intermediation. As noted in

de la Torre, Levy Yeyati and Schmukler (2003), after the collapse of the currency board and the forced conversion, Argentina, which previously had financial intermediation without a flexible currency, now has flexibility with very limited banking. In other words, currency mismatches have been replaced by maturity mismatches.

Finally, the manner in which Argentina exited convertibility had major implications on the enforcement of property rights and contracts.[19] The credibility in financial institutions and the investment climate in general are unlikely to recover quickly due to frequent discretionary changes in contracts and regulatory frameworks.

11.5 Lessons from country experiences and policy implications

The experiences of these countries show that forced de-dollarization imposes a large and persistent cost on most sections of an economy. There is an immediate cost, as existing contracts are re-denominated and the availability of liquidity is disrupted. There is also an immediate but non-transparent redistribution of wealth. The longer-term costs may be even more substantial. Savers who wished to keep assets in dollars in the domestic financial system will now, if possible, switch to the nearest alternatives, namely assets abroad and consumption. Banks may prefer to concentrate on fee-based business rather than intermediation if they believe that the government will intervene ex post in their agreements with depositors or borrowers. Borrowers who could afford (at least in cash flow terms) financing denominated in foreign currency will have to scale back projects. The persistent consequences may include low intermediation, low savings and investment, capital flight and high-risk premia.

The governments that undertake forced de-dollarization may well be aware of these risks. They may also be aware that de-dollarization and similar actions (such as securitization of deposits) may have highly arbitrary redistribution effects. As far as the authors are aware, no government has chosen this path except in exceptional circumstances when the alternatives looked even worse.

The proximate cause of forced de-dollarization is usually a foreign exchange crisis; the country is running out of foreign exchange to meet its external obligations and perhaps its domestic dollarized obligations. The main underlying cause seen in the examples was an unsustainable fiscal situation, which generally led to the accumulation of a large stock of foreign currency-denominated government debt. The immediate trigger for the crisis may, however, be political (as in the case of Pakistan). Once fear of a crisis begins to intensify, there is likely to be a run on FCDs (and possibly local currency deposits also), which will drain off more foreign currency liquidity.

A common thread in the several country experiences is that deposit dollarization – and forced de-dollarization of deposits – is relatively easy to cope with if that is the only issue. The costs of de-dollarization are much higher and the chances of success are lower when credit (and other contracts) is dollarized. Four factors come

into play:

- First, credit contracts are much more complex than deposit contracts. A loan agreement typically addresses numerous contingencies and redenominating a loan contract requires also complex renegotiating of pricing (the risk premium). Such renegotiation takes time, especially in the uncertain environment in which mandatory de-dollarization is undertaken. Until lenders and borrowers have renegotiated the outstanding stock of redenominated loans, they are unlikely to agree on new financing. Hence, enterprises will be starved of credit.
- Second, deposits and, in particular, savings deposits may be less important for ongoing economic activity than credit. If an enterprise cannot roll over a line of credit, it will be in default and may be liquidated. Hence, output and employment drop, with a multiplicative effect on demand. If a household that is a net saver temporarily loses access to its bank accounts, it can carry on much as before.[20]
- Third, the extension of foreign currency loans by domestic banks implies that banks create FCDs; a balance of payments inflow that provides banks with some foreign assets is likely to have a multiplicative effect on both FCDs and foreign currency lending. Hence, forced de-dollarization of both deposits and credit will disrupt both sides of the banks' balance sheets. It could also change the monetary transmission process because the supply of and demand for loans could be affected by the breach and the change in banks' portfolio.[21] In contrast, without foreign currency credit, the stock of FCDs is closely linked to balance of payments developments, which limits the (ex post) magnitude of fluctuations. Furthermore, de-dollarization of FCDs alone should not have a first-round impact on the supply of credit and monetary transmission.
- Finally, those who have borrowed in foreign currency constitute a strong lobby group, whose vital interests may be imperiled in the turbulent circumstances surrounding forced de-dollarization. Their interests may be in conflict with those of depositors, a conflict that may be resolved by passing the burden onto some other sector. The Argentinian authorities, for example, responded to such pressures by choosing asymmetric pesoization of deposits and loans. Borrowers benefited (at least initially), but banks' capital was largely eliminated, which in turn led to a sharp decline in extension of credit.

Since forced de-dollarization has not been undertaken except in very difficult circumstances, it is hard to separate its effects from those of other events. The outcome in some cases seems to have been relatively benign in that: (i) the economy 'bounced back' quickly and, in particular, the output loss was limited; and (ii) de-dollarization persisted beyond the emergency and indeed even when restrictions were lifted. The experience of Pakistan, it can be argued, meets both criteria. To date, the experience of Argentina meets (ii) but not (i); conclusions are less definite because less time has elapsed.

Even in the often extreme and perhaps chaotic circumstances in which the authorities choose de-dollarization 'the hard way', some policy principles can be

followed to increase the chances of success and to minimize the negative side effects. The varied experiences described here, combined with the application of some general economic reasoning, suggest a number of such principles. Many of them would apply also to efforts to induce voluntary, slow de-dollarization, but are at least as important when conversion is compulsory. Moreover, several of the recommendations listed below apply in almost any scenario involving forced de-dollarization, while others may be suitable only in certain restrictive circumstances or if very carefully implemented.

Discourage foreign currency lending

As argued above, foreign currency lending, especially to non-export-oriented sectors and households, creates additional prudential and macroeconomic concerns. Hence, the arguments for discouraging foreign currency lending may be stronger than those for discouraging FCDs. Many countries have an outright ban on bank lending to residents, or at least for non-export related business. One could also imagine adapting other regulations, such as the setting of risk weights for capital requirements or limits on lending to households relative to household income, to discourage foreign currency lending beyond what would be called for based on purely microeconomic prudential considerations.

Remove regulatory incentives for dollarization

Dollarization has often been favoured by various regulatory provisions that disadvantage saving and financing in the local currency (as was most clearly the case in Pakistan). Removing these incentives should at least slow the pace of further dollarization or the recurrence of dollarization once de-dollarization has been achieved by other means. The main incentives affect savers and intermediaries (institutionalized incentives for foreign currency borrowing are less common):

- *Depositors*. FCDs should not be treated more favourably than local currency deposits in such matters as the coverage of for deposit insurance and the prioritization of claims in the event of bank resolution; these factors may be most salient when de-dollarization is undertaken in the context of a banking crisis. Fiscal provisions also need to be designed to be at least neutral between currency denominations. For example, account needs to be taken of capital gains on FCDs in case of depreciation (following forced de-dollarization, savers may give weight to the possibility of an exchange rate crisis, and anticipate large capital gains on FCDs), and income tax provisions may need to allow for differences in nominal yields.[22]
- *Banks*. Prudential and other regulations should not be distorted in ways that favour foreign currency intermediation, and indeed that allow for the complex of risks that they can engender. Thus, for example, the risk weight on bank assets, reserve requirements and liquidity requirements need to be chosen in this light.

Do not heavily penalize one sector

Policies need to achieve, and be seen to achieve, a reasonable degree of burden sharing. This is partly a matter of equity and welfare maximization; if there is diminishing marginal utility, the spreading of costs reduces the total welfare loss. More concretely, if one sector or section of society suffers disproportionately, it will have great difficulty restoring normal operations, or it will have especially little trust in economic institutions and the commitment of the authorities to follow policies consistently. Hence, the economy as a whole is likely to take longer to return towards equilibrium following forced de-dollarization. Furthermore, the most disadvantaged groups are likely to put up fierce political resistance, leading to a policy reversal.

Do not decapitalize the banks

Circumstances under which forced de-dollarization is imposed almost invariably involve a range of economic shocks, such as a balance of payments or exchange rate crisis or a fiscal crisis. These shocks will in themselves occasion a deterioration in the quality of banks' assets and impose other costs on banks (for example, due to a shortage of liquidity or higher interest rates on their short-term liabilities while returns on longer-term assets are slow to adjust). A weakened banking system is likely to curtail lending and thus propagate and exacerbate the effects of the shocks. Policies that have the effect of reducing the capitalization of a large share of the banking sector will then make the situation worse. If banks have to conserve capital by concentrating on short-term and low-risk assets, the availability of working capital and investment financing will dry up and the corporate sector will suffer severely, and economic activity will contract. A vicious circle of lower output, non-performing loans and bank losses may result. In the end the government will almost certainly have to recapitalize the banks and then go through the complex process of reprivatizing them.

Do not forbid new FCDs

The episodes related here suggest that there is little danger in allowing the opening of new FCDs, free of restrictions, provided that positive incentives for dollarization have been removed. The experience of forced de-dollarization will reduce the supply of savings into FCDs, so a strong resurgence in dollarization is unlikely so long as macroeconomic stabilization is on track, local currency interest rates are allowed to adjust and regulations favouring FCDs are removed. FCDs in moderation can be helpful by providing banks with foreign currency liquidity, for example, for financing lending to exporters.

Do not use the counterpart to FCDs as usable reserves

Forced de-dollarization has often been the outcome of the authorities' use of FCDs to finance capital flight or imports directly, or through the government's fiscal operations. To avoid the recurrence of an emergency, the counterpart of (remaining or new) FCDs needs to be kept in relatively liquid form, such as in the foreign assets of commercial banks or the central bank.

Allow two-way exchange rate flexibility

Exchange rate flexibility may help discourage dollarization by exposing all market participants to the risk of valuation losses; there are no 'one-way bets'. Furthermore, such flexibility is almost a precondition for the development of an efficient market for hedging instruments; if the exchange rate is tightly controlled or if it moves in only one direction, the differences in opinion and information among participants may be too small to drive active market trading. Prices and availability in an illiquid market are likely to be unfavourable, which feeds back into low participation.

11.6 Concluding remarks

Forced de-dollarization is highly disruptive. The mandatory re-denomination of obligations involves the breach of a multitude of contracts and the government revealing a willingness to overrule the property rights of much of the population. Dollarization is itself largely a manifestation of distrust of government policies, which forced de-dollarization confirms. Much time and many favourable circumstances will be needed to re-establish trust and, in particular, confidence that another round of de-dollarization or more extreme expropriation will not be forthcoming.

Given these risks, forced de-dollarization will be politically very difficult to undertake except in extreme circumstances. In principle, compulsory currency conversion could be a useful policy tool in 'normal' times to accelerate de-dollarization in the context of an overall strategy to revive demand for the local currency. In such circumstances, it may be easier to determine an appropriate conversion rate and less severe restrictions on withdrawals may be manageable. However, in a country where economic policies have induced significant dollarization, economic agents are unlikely to be quickly convinced that forced de-dollarization signals the start of a new, better policy regime and that the infringement of property rights will not be repeated. Hence, even in good circumstances, forced de-dollarization is likely to prompt some capital flight and disintermediation.

Forced de-dollarization is not a panacea: if faith in the national currency is not restored, re-dollarization in the form of FCDs or capital flight will be unavoidable and these costs will have been incurred without benefit. Other measures are needed to reduce the associated costs and improve the odds that the economy will recover rapidly. At a microeconomic, institutional level, preferable policies are those that minimize the breach of contract and ensure that such breaches that are imposed are transparent and equitable. At a macroeconomic level, policy rules and decision-making mechanisms need to be established that promote stabilization of domestic monetary conditions. Thus, whether a country attempts to de-dollarize 'softly' or is forced to de-dollarize 'the hard way', the underlying causes of dollarization need to be addressed if the effort is to be worthwhile.

Notes

1. The authors would like to thank Herman Kamil for his contributions and Nada Oulidi for able research assistance.
2. Attention is on partial dollarization, where the national currency still plays some role, rather than official, complete dollarization, which raises a somewhat different set of issues.
3. The term 'dollarization' is used as shorthand for the use of a foreign currency. In many European countries, the euro plays the role of the favoured foreign currency.
4. De Nicoló, Honohan and Ize (2003), for example, test a model relating demand for a portfolio of domestic and foreign currency deposits to risk of inflation and real depreciation. Based on a sample of 75 countries, they find that these risks are positively and significantly correlated with observed values of deposit dollarization. Thus, dollarization appears to be at least in part the rational response of agents to a lack of monetary policy credibility.
5. An example of a possible hysteresis effect might be found in the payment system: suppose that, before dollarization, the system could handle payments in national currency only. If software is installed to handle foreign currency transactions between residents, transacting in foreign currency becomes permanently much easier.
6. See Savastano (1992) for a detailed analysis.
7. Exchange and capital controls, however, were removed later in August 1990.
8. In Bolivia, within three years of the decision in 1985 to re-legalize dollar accounts, 70 per cent of all savings deposited in commercial banks were denominated in dollars.
9. Using cross-country data, Ize and Levy Yeyati (2003) find that dollarization of deposits is significantly lower in countries where indexation is prevalent. See also Galindo and Leiderman (2003).
10. During this period Pakistan maintained a complex system of restrictions on the making of current and capital account payments.
11. Dollarization of transactions and lending was never widespread in Pakistan.
12. At their peak in the mid-1990s foreign currency bearer certificates constituted about 8 per cent of domestic government debt.
13. The stock of FCDs was $4.7 billion at end-1996, $6.3 billion at end-1997 and peaked at $7.2 billion in April 1998. They had fallen to $6 billion by June 1998.
14. The authorities also eventually renegotiated foreign debt.
15. The same conditions applied to foreign currency bearer bonds.
16. Initially the 'Special US Dollar Bonds' had a maturity of five years and a yield of LIBOR+2. Later the maturity was reduced to three years and the yield raised to LIBOR+4.
17. Holders of FCDs suffered a valuation loss because conversion was at the old, less depreciated exchange rate. However, because inflation was moderate, in real terms the loss of principal was small.
18. See Daseking *et al.* (2004).
19. See de la Torre, Levy Yeyati and Schmukler (2003).
20. This is not to say that depositors will not protest vigorously and even violently to protect their interests.
21. Under dollarization, a bank that receives an FCD needs to find a matching foreign currency asset. Once assets and liabilities are de-dollarized, any extra deposit can be placed in a wider selection of assets.
22. Suppose that FCDs yield 4 per cent annually and local currency deposits yield 16 per cent. A tax rate of 25 per cent will reduce the spread, which determines the optimal portfolio allocation, from 12 percentage points to 9.

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Comments on Part IV

Augusto de la Torre

The two very good chapters in this section deal with significantly different aspects of the debate on financial dollarization and de-dollarization. Chapter 10, by Holland and Mulder, discusses the potentially beneficial role that inflation-indexed debt can play for the government's debt management in particular and for the development of the local currency debt market more generally. Chapter 11, by Hardy and Pazarbasioglu, by contrast, examines key issues in episodes of forced or involuntary de-dollarization. I will not attempt to discuss the substance of each of these chapters. To do so might prove unmanageable within these short comments and, in any case, would fail to do justice to the two chapters, given the differences in topic and approach. Instead, I will discuss a single question – can CPI-indexed debt significantly help induce the voluntary de-dollarization of financial contracts? My comments are hopefully complementary to the chapter by Holland and Mulder, which does not really address this question directly.

In the Latin region, financial contracts that are indexed to the CPI are typically denominated in a unit of account which is itself linked to the CPI in a backward-looking fashion but with a relatively short lag. For convenience and to honour the popularity of Chilean nomenclature, I will henceforth refer to that unit as UF. Now, I will argue that the question of whether UF-denominated debt contracts can help promote de-dollarization is not as simple as it might appear to be. The evidence that UF-based financial contracting was historically crucial in *preventing* financial dollarization does not imply that the UF can help in *reversing* dollarization once it has taken root.[1] For example, the use of a stake to support a young tree can indeed prevent it from growing crooked, but this does not imply that the same support would straighten a crooked tree once mature.

That hysteresis is a feature of financial dollarization should not be surprising if initial conditions and path dependence are taken seriously. To illustrate this point, consider the case of the Chilean UF. The UF was instrumental in preventing financial dollarization in Chile because it was accepted by the population as a store of value for savings and this in turn was a function of initial conditions and path dependence. Initial conditions included not just an active promotion of the UF by the government, but also a high and highly volatile inflation, a high pass-through (due to widespread backward-looking wage and price indexation) and, importantly,

severe legal and regulatory impediments to using of the dollar for financial contracting at home (see Herrera and Valdés, 2005). Given this initial context, path dependence enabled the UF to become rooted in financial markets. Why? Because the associated changes in financial contracting practices became self-reinforcing as a consequence of the increasing returns and network externalities inherent in institutional change – that is, as a consequence of the large set-up costs of new UF-consistent institutions, the subsequent lowering of uncertainty and transaction and information costs and the associated spill-overs for financial contracting. One can thus surmise that if financial dollarization could not be prevented and instead became locked-in in other countries, it must have been due to a complex interaction of different initial conditions and a different process of path dependence compared to those that obtained in Chile. This reasoning highlights a crucial but often downplayed point in the de-dollarization debate – that an isolated instrument such as the UF, which was helpful in averting dollarization under a given institutional matrix, may simply not stick in another institutional milieu.

The burden of the proof thus falls on the proponents of the UF as a de-dollarization tool. They would need to build a solid case – a task that in my mind has not yet been done – of why savers/investors would find the UF more appealing than the dollar in the circumstances that typically characterize the financially dollarized Latin countries of today. These circumstances – which are in sharp contrast to those present in Chile when the UF was introduced – include a low rate of inflation, a low pass-through, the well-entrenched position of the dollar in financial contracting, the absence of legal and regulatory impediments to dollar-based financial intermediation[2] and the high degree of integration with international financial markets. I am already convinced that a deep market for UF-denominated long-duration debt would have many positive benefits for financial development, provided that savers use the UF intensively. What is much less clear to me is why investors would do so in the mentioned circumstances and if they already rely on the dollar.

The challenge before us is, therefore, to better understand the conditions under which, given the mentioned circumstances and considering institutional path dependence, the UF could help de-dollarize financial contracts. To frame the discussion of this question more pointedly, I would like to submit four propositions developed in detail in a paper that I recently wrote with Sergio Schmukler (de la Torre and Schmukler, 2004).

Proposition 1: the currency of denomination (dollar, peso, or UF) and the duration (short or long) of a financial contract are devices used by rational investors to cope with systemic risks (i.e., macroeconomic volatility and weak contractual institutions) in emerging economies. In particular, dollarized contracts, UF contracts and short-duration peso contracts are substitute ways of hedging price risk (i.e., inflation and interest rate volatility).

Proposition 2: there is an inherent trade-off between exposure to price risk, on the one hand, and exposure to price-induced default risk, on the other. Thus, by

investing in a short-duration (peso or UF) contract or in a dollarized contract, the investor hedges against unexpected movements in inflation or the real interest rate *at the expense* of taking on an open exposure to the risk that the debtor might default if hit by an unexpected rise in the real interest rate (in the case of a short-duration contract) or by an unexpected and large real devaluation (in the case of a dollarized contract).

Proposition 3: as systemic risks rise, the equilibrium outcome settles in favour of investor protection against price risk (through dollarization or short duration) at the expense of exposure to price-induced default risk, instead of the other way around. One reason for this is the fact that the contract is a legal claim that gives the investor an option to litigate and recover some value in the event of default.

Proposition 4: for a given level of systemic risk *and* investor appetite for systemic risk, efforts to repress financial dollarization may only displace (rather than reduce) risk. In other words, the repression of the currency mismatch may, all other things equal, only lead to a compensating increase in another mismatch – i.e., the duration mismatch implied in short-duration peso debt contracts – or to the shifting of dollar contracts from the local market to the offshore market.

Given these propositions, let us go back to the question of whether the UF could really draw investor interest in economies with low inflation and where financial dollarization is already well established. Assume, first, that the relevant macroeconomic environment is one where inflation and the interest rate are more volatile than the real exchange rate. Per the seminal article of Ize and Levy Yeyati (2003), financial portfolios in that environment would be tilted in favour of the dollar. Assume, now, that the government attempts to introduce the UF, all else equal. Would investors shift voluntarily from dollar-based to UF-based financial contracts? The answer is most likely no. Why? Because the UF offers no obvious advantage to investors as a risk-coping device compared to the dollar. Take a long-duration UF-denominated contract (i.e., a long-term UF contract with a fixed interest rate). It would be almost as good as the dollar in protecting the investor against inflation risk but, unlike the dollar, it would not enable the investor to hedge against real interest-rate risk. Take, now, a short-duration UF contract (i.e., a short-term UF contract, or a long-term UF contract where the interest rate adjusts frequently, say, every month). It would be almost as good as the dollar in protecting the investor against inflation *and* real interest-rate risks. But, unlike the dollar, the short-duration UF would not protect the investor against real interest rate-induced default risk. Moreover, in an environment where inflation and the real interest rates are more volatile than the real exchange rate, the UF would be an inferior risk-coping device compared not only to the dollar but also to a short-duration peso contract.[3]

It follows from the previous reasoning that isolated gimmicks are unlikely to lead to de-dollarization. Financial dollarization is a symptom, a response to weaknesses in macroeconomic and institutional fundamentals that give rise to high systemic risks. Attacking the symptom without addressing the underlying causes can backfire. Hence, the sufficient condition for financial de-dollarization is also a

fundamental condition, namely, the permanent reduction in systemic risk. On the macroeconomic policy front, such a reduction requires structural improvements in the solvency of the government. Progress towards more resilient fiscal solvency would in turn underpin a robust framework of independent monetary policy featuring inflation targeting-cum-exchange flexibility. As a result, the volatility of inflation and the real interest rate would be durably reduced relative to the volatility of the real exchange rate, thereby creating the type of credible nominal stability that would foster the use of the local currency as a store of value for savings, with the consequent de-dollarization of financial contracts.

The de-dollarization effect of improvements in fiscal and monetary fundamentals could be, no doubt, enhanced by complementary policies in other fronts, including actions to strengthen the prudential and contractual frameworks as well as the introduction of CPI-indexed long-duration debt contracts. The UF alone would accomplish little, but the UF in an environment of improving macroeconomic and institutional fundamentals could have a significant impact. In that context, appetite for CPI-indexed debt could be boosted through a government debt management strategy that would seek to develop a reliable yield curve in long-duration CPI-indexed sovereign bonds. That could, of itself, lead to improvements in fiscal viability – by narrowing the scope for time-inconsistent government misbehaviour and by reducing the government's exposure to risk for a given cost. However, the clincher for the establishment of the UF has to come ultimately from strong investor demand. This would clearly materialize to the extent that the reformed pension systems of the Latin American region mature, thereby giving rise to a growing market for annuities, with annuity providers (typically life insurance companies) increasingly needing long-duration CPI-indexed assets to hedge their growing long-duration CPI-indexed liabilities.

Notes

1. Financial dollarization was also prevented in some cases – notably Brazil – by the practice of indexing debt contracts to the local short-term interest rate, combined with legal and regulatory limitations on the use of the dollar for private financial contracts at home (Arida, Bacha and Lara-Resende, 2005).
2. In fact, the use of the dollar is not only not restricted in the financially dollarized countries; it is, as noted by the papers by Ize and Levy Yeyati, rather promoted by the macro policies and the regulatory environment. I see this pro-dollarization bias as a natural by-product of path dependence.
3. As the experiences of Colombia and Ecuador during the 1990s show, high real interest-rate volatility is public enemy number one of the UF. Such volatility caused the budding UF to disappear in Ecuador in the mid-1990s and it caused the UF to be replaced by indexation to the nominal interest rate in the case of Colombia in the second half of the 1990s.

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Comments on Part IV

Luis O. Herrera

The issuance of inflation-indexed bonds is becoming conventional across the world. All G7 countries, except for Germany, and many other industrialized countries are issuing indexed bonds. Many emerging market economies have issued indexed bonds in recent years (Chile, Mexico, Colombia, Peru, Brazil and Uruguay). However, it is not clear why this is happening now. Why are inflation-indexed bonds developing faster in an environment of low and more stable inflation, low nominal interest rates and high credibility of central banks? I don't have an answer but it seems puzzling.

There is little doubt that it is advisable to issue inflation-indexed bonds. This is true whether or not an economy is financially dollarized. There are a number of reasons.

- Inflation-indexed bonds offer convenient risk-return properties for the government and investors.
- They may have a strategic role to play in supporting the credibility of monetary and fiscal policies.
- They complete financial markets and help to measure inflationary expectations.
- Finally, indexed bonds may help to develop long-term local currency markets in inflation-prone countries.

A different question is whether it is convenient to move from financial dollarization to financial indexation. If the economy is dollarized, should the government attempt to shift to full-fledged financial indexation or should it attempt to boost nominalization? Financial indexation may promote greater financial stability and enhance the transmission mechanisms of monetary policy but it also has some costs. The case of Chile may shed light on this question.

Chile's experience is often cited as a case of successful financial indexation. Despite relatively high inflation in the 1980s and early 1990s, Chile developed relatively deep markets for local currency deposits, loans and securities through extensive use of CPI indexation in financial contracts (known as UF[1]). Currently, local currency deposits and loans represent 60 per cent of GDP, while local currency bonds have reached 50 per cent of GDP.

However, I want to stress that the issuance of CPI-indexed bonds was only one aspect of a broad set of policies that supported and encouraged real and financial indexation through the 1970s and 1980s. Besides the early adoption of the UF in the 1960s, there were other factors that promoted financial indexation. These included, among others, the introduction of indexation in the tax code and accounting rules in the 1970s, the introduction of mandatory wage indexation (until 1981), the indexation of regulated prices, legal entitlements and penalties, issuance of indexed public debt in the 1980s, indexing the nominal exchange rate from 1984 until 1998, and targeting (smoothing) the interest rate on indexed financial operations until 2002 as the operational target for monetary policy. I call this system *fully fledged indexation*. It is much broader than just issuing CPI-linked bonds.

Financial indexation generated significant benefits for the development of Chilean capital markets and financial intermediation, but it also incurred certain costs. Real indexation became widespread in the Chilean economy through the 1980s. Wages, rents, schooling bills, taxes, etc. all became indexed to the UF. Inflation tolerance in the public increased and so did inflationary inertia and volatility. Relative prices, as real wages and the real exchange rate, became more rigid, potentially increasing the volatility of output and employment. All these features required the Central Bank to follow a slow process of reducing inflation through the 1990s to minimize the costs of disinflation, despite good macroeconomic, financial and institutional fundamentals.

Financial indexation was also very persistent through the 1990s despite systematic inflation reduction and higher monetary credibility (coordination problems and switching costs). Only since 2001 has the economy started moving towards financial nominalization. Liquidity in local financial markets remains relatively fragmented between nominal and indexed financial operations. Long-term investors, such as pension funds and insurance companies, concentrated in indexed instruments, while shorter-term investors, such as mutual funds, banks and corporates managing their liquidity, are concentrated in nominal instruments. This feature has made it harder for Chile to integrate local and international financial markets.

The point is that a fully fledged financial indexation becomes entrenched in the economy. Indexation has some costs and it may last for too long. Thus, an economy that has already achieved price stability but is still dollarized should make it a priority to go directly for nominalization, rather than to look for an intermediate alternative in financial indexation. Attempting financial indexation may be a long detour and it may create significant switching costs to subsequent nominalization.

Note

1. The UF is used in Chile as a unit of account for financial transactions. It is calculated on the tenth day of each month by a linear amount each day. Thus, by the ninth day of the next month its value will have increased by the same percentage as much as the CPI had two months before.

Comments on Part IV

Claudio Irigoyen

The two chapters in this section tackle the very important topic of de-dollarization, certainly still a central issue for many Latin American economies. Chapter 10 addresses the question of how inflation-linked bonds can improve the composition of government debt in terms of maturity structure and rollover risk. The authors stress the role of indexed government debt as a key ingredient for the development of deeper markets that include privately issued indexed debt as well. Chapter 11 analyzes several de-dollarization experiences, highlighting the defining characteristics of both successful and unsuccessful ones.

I will mostly concentrate my comments on the first topic, related to the role of indexed debt (though not necessarily indexed to inflation) in a framework of optimal management of public debt. I will also discuss some issues related to the development of a market for indexed securities issued by the private sector.

The first question to be addressed is: what is the optimal composition of a public debt portfolio from the government's perspective? The answer depends not only on the credibility of monetary and fiscal policy but also on the stochastic structure of the economy. Low credibility induces a higher proportion of indexed debt in an optimal portfolio (usually indexed to inflation) if the government does not want to confirm a relatively high risk premium for long-term nominal debt. Alternatively, governments may prefer to issue short-term debt as a solution to the same problem, at the expense of a higher rollover risk. Excessive short-term debt or long-term debt with floating rates may create a problem of fiscal dominance, constraining in this way the conduct of monetary policy. On the other hand, tax-smoothing considerations prescribe the issuance of nominal debt such that the real value of debt correlates negatively with shocks that might hit the economy (in bad times the real value of debt falls).

A more precise prescription depends on the particular stochastic structure of the economy, where indexed debt appears to be optimal to deal with aggregate spending shocks and nominal debt for supply shocks. For instance, a positive covariance between primary deficits and inflation favours the issuance of nominal debt, while a high variance of inflation increases the attractiveness of inflation-indexed bonds to avoid paying a high inflation-risk premium. In order to signal commitment to healthy public policies, many countries have indexed government debt to the

exchange rate, or simply issued foreign currency-denominated debt instead of indexing it to inflation. The choice of indexation benchmark is also a function of the stochastic structure of the economy. If inflation and the real exchange rate correlate positively, nominal bonds and foreign currency-denominated bonds are complements. Nonetheless, foreign denominated debt might be too risky when the country is subjected to sudden stops, the risk being negatively related to the openness of the economy and the size of the tradable sector, and positively related to the degree of liability dollarization of the economy as a whole.

A corollary is that, depending on the structure of the covariance matrix of shocks, there might be a role for indexed debt even in a full credibility environment. Based on the same considerations, it might be optimal to issue some nominal debt even under severe credibility problems.

The analysis above should not be considered as purely static. It is a dynamic problem in the sense that optimal debt composition must be revised over time as credibility and reputation evolve and the stochastic structure of the economy changes. On the other hand, debt composition has an endogenous impact on the overall cost of debt, as credit risk (or default risk) is not independent of the incentives of the government to follow time-inconsistent policies, based on the actual composition of the debt portfolio.

Another recently popular product is debt indexed to the performance of the economy (GDP-linked bonds). The pay-off of these bonds is a positive function of the rate of growth of the economy, acting, therefore, as an automatic stabilizer of the debt to GDP ratio (although this ratio is not a good measure of the debt sustainability). As already underlined, the convenience of this type of bonds depends (among other things) on the covariance between the rate of growth of the economy (also a random variable) and the rest of the shocks to which the economy is subjected. Some observers suggest that in countries that depend heavily on the price of specific commodities public debt should be indexed to them based on tax-smoothing considerations.

Another question of interest is: what is the role of government debt in developing markets for privately issued indexed debt? What are the issues at stake in the indexation of private debt?

The development of a market for indexed government debt creates a positive externality for private borrowers. If there is a deep market for indexed government debt, it is much easier to price private indexed debt, even if indexation is related to different variables.

Nonetheless, the main consideration when analyzing the optimality of issuing indexed debt from the point of view of a corporation is the trade-off between hedging and liquidity. Hedging considerations recommend indexing to the relative price of the product commercialized by the company, or similarly, to the key relative price that influences its revenues. This argument rationalizes why governments index public debt to inflation. The problem with this prescription is that if all companies index debt to their key relative prices, a scale problem arises. On average, individual issuances are not large enough to ensure that those privately issued papers will be liquid enough, which will certainly have an impact on the

cost of debt. One alternative is to index debt to inflation or the exchange rate (an imperfect hedge but a more liquid instrument). In that case, the role of the government in developing markets for indexed debt becomes crucial.

It is important to distinguish between causes and consequences of inflation in order to analyze the merits of inflation-indexed bonds. It has been argued that the issuance of inflation-protected bonds fosters indexation of the whole economy through fostering wage indexation and increasing inflationary inertia. This argument is flawed. Bad monetary or fiscal policy are instead to be blamed. The indexation of assets is a way to complete markets since it is definitely welfare improving.

Finally, a few words about the second topic: de-dollarization. Independently of the way de-dollarization took place in some emerging economies, the challenge is how to avoid re-dollarization. In that respect, much of the homework concentrates on the regulation of the financial system. One of the main features of dollarized financial systems is their exposure to real exchange rate fluctuations (that feed naturally into credit risk), reflecting the fact that they on lend denominated deposits to individuals or firms with an income in domestic currency.

Among other things, it is important to include in the policy menu: (i) high provisioning requirements for dollarized assets; (ii) high reserve requirements (with fairly low remunerations) for dollar-denominated deposits, coupled with restrictions on applications (to avoid massive currency mismatches); (iii) the development of markets for indexed assets as a substitute for dollarization (an intermediate step towards nominalization); and (iv) the development of derivative markets that help to deal with foreign exchange rate volatility. Needless to say, those initiatives are not substitutes for sound monetary and fiscal policies. The latter are absolutely necessary conditions for price stability and therefore the main ingredients of any de-dollarization strategy.

Part V
Looking Ahead

12

Currency Mismatches and Domestic Liability Dollarization

Philip Turner[1]

12.1 Introduction

My views on the policy implications of dollarization – that is, the use of foreign rather than local currency – can be briefly summarized. While some have argued that it is endemic, I shall argue that dollarization in medium-sized countries reflects bad policies. Indeed, better policies during the past decade have diminished reliance on foreign currency and increased borrowing in domestic currency. The rapid development of domestic currency bond markets, together with the growing interest of foreign investors in such markets, represents huge progress. But it does raise new questions that require attention.

All economists working on Latin America have heard of 'original sin'. The idea is that the inability of developing countries to borrow abroad in their own currencies makes currency mismatches almost endemic. The leading exponents of this idea have been Barry Eichengreen and Ricardo Hausmann, who have presented several versions of this thesis.[2]

The basic idea of the 'original sin' metaphor is that it is innate weaknesses, not past behaviour, which determines how developing countries can borrow. Morris Goldstein and I have argued in a recent book that the statistical measures used by Eichengreen and Hausmann are flawed and that their 'original sin' hypothesis is too pessimistic.

It is necessary to consider the logic of a currency mismatch. The notion of currency mismatch refers to the impact of a change in the exchange rate on the present discounted value of future income and expenditure flows. Hence *all* assets and liabilities must enter the calculation – not just cross-border assets and liabilities. The denomination of contracts between residents in foreign currencies matters because a sharp change in the exchange rate can disrupt such contracts and this can have real economic effects. Foreign currency debts between residents may 'cancel out' in normal times, but do not do so in a crisis. This is why the focus of this volume on domestic liability dollarization is so important.

The currency denomination of other income flows is also important: foreign currency borrowing to finance the production of tradables is one thing – to finance non-tradables quite another.

It follows from this that a key ratio is the ratio between the currency denomination of debt and the share of tradables in GDP. To put the point at its most measurable: countries with high export/GDP ratios can sustain higher foreign currency shares in total debt. If this ratio is greater than one – more foreign currency debt than foreign currency earnings to finance – then the country has a problem. How large a problem depends on a country's net foreign currency position: a large net liability position compounds the difficulty.

The index for aggregate 'effective' currency mismatch (termed AECM) that Morris Goldstein and I constructed is the product of these two variables. In symbols, the mismatch ratio is:

$$\text{MISM} = \frac{\text{FC\%TD}}{\text{X/Y}}$$

where FC%TD = Foreign currency share of total debt
X = Exports of goods and services
Y = GDP

Then the aggregate 'effective' currency mismatch (termed AECM) is the product of MISM and net foreign currency assets (NFCA) as a percentage of GDP viz:

$$\text{AECM} = \frac{\text{NFCA}}{\text{Y}} \cdot \frac{\text{FC\%TD}}{\text{X/Y}}$$

$$= \frac{(\text{NFCA})(\text{FC\%TD})}{\text{X}}$$

If foreign currency assets are exactly equal to foreign currency liabilities then AECM is zero – that is, there is no aggregate effective currency mismatch. This would be true even in a dollarized economy – where debts were largely denominated in dollars. If a country has a net liability position in foreign exchange (i.e., NFCA is negative), AECM will also be negative.

This measure can be thought of as a stress test for the economy – combining a mismatch ratio with a measure of a country's net foreign currency position. What is the interpretation of this ratio for a dollarized economy? In a dollarized economy the pure mismatch ratio – basically the foreign currency share of total debt – is very high. How much of a risk this presents to the country depends on the country's balance between its foreign currency assets and its foreign currency liabilities, that is the net foreign currency position.

12.2 A domestic policy agenda

Several contributors to this volume echo the view Morris Goldstein and I advocated: policy-makers in medium-sized emerging market economies *can* do a lot to encourage the denomination of debts in local, not foreign currency. There is obviously a macroeconomic dimension. Countries that pursue inflationary or erratic macroeconomic policies obviously find it hard to borrow in their own currencies.

Fiscal deficits must be limited. Monetary policy should aim for low inflation. Fixed exchange rates, which encourage undue reliance on 'cheaper' dollar borrowing, should generally be avoided.

The microeconomic policy dimension is also important, and the following five policies deserve attention. Governments should:

- Ensure accounting rules require the full disclosure of exchange rate-related losses from foreign currency-denominated borrowing. Without this, governments and corporations can report lower interest payments if they borrow in dollars or euros, so that their financial position looks healthier than it really is. A more prudent borrower – borrowing in local currency and paying a high rate of interest – therefore looks worse. The monitoring of foreign currency exposures by banks and regulators needs to be continuous and flexible enough to catch new forms of exposure, particularly through derivatives.[3]
- Not weaken their own credit standing by denominating too much of their borrowing in foreign currencies. A simple balance sheet perspective would suggest that borrowing to finance local currency assets should be in local currency. In addition, borrowing in local markets helps fiscal discipline because it exerts immediate upward pressure on domestic interest rates. The unpopularity of higher interest rates can, with luck, create a political constituency for lower budget deficits. Issuing foreign currency debt abroad attempts to evade this key element of market discipline.
- Encourage the entry of foreign banks. Too many crises have demonstrated all too clearly the dangers of relying on cross-border dollar loans from foreign banks. For this reason, the increase of local currency lending through foreign affiliates has been one of the remarkable developments of the past five or six years.[4] It is not often appreciated just how far this process has gone. According to some preliminary Bank for International Settlements (BIS) estimates, for instance, more than 60 per cent of the exposures of banks in major financial centres vis-à-vis emerging markets is now in local currency.
- Develop a liquid local currency bond market.
- Make the prudential oversight of financial institutions more mismatch-aware. This does not, of course, mean that public policy should crudely force de-dollarization – but just that it should ensure all risks are correctly assessed. Prudential oversight has both a micro dimension (the oversight of individual institutions) and a macro dimension (oversight of the system as a whole). There is little to add to the excellent chapter in this volume on the micro dimension by Jorge Cayazzo, Socorro Heysen, Antonio Garcia Pascual and Eva Gutierrez.

The better supervision of individual institutions needs to be supported by more effective oversight of the system as a whole. The practical difficulty is that quantifying such exposures is quite complex. The standard balance sheet indicators such as net open positions and gross foreign currency lending to domestic firms tell only part of the story. The IMF has recently done some very interesting work in this area.[5] A major virtue of this work is the trouble taken to combine the currency and the maturity dimensions of mismatches.

During the past decade, policies in Latin American countries have improved. Fiscal and monetary policies are better. Most countries have flexible exchange rates. Domestic bond markets are developing – Mexico is a striking case in point. Foreign currency-linked borrowing is being phased out – look at Brazil over the past eighteen months. Supervisory regimes have been overhauled.

What has happened to mismatches? In the mid-1990s, the pure mismatch ratio mentioned earlier – the ratio between the foreign currency proportion of debt and the share of exports in GDP – was well over one in all the larger countries except Chile. By 2004, the ratio had been significantly reduced. This is shown in the top panel of Figure 12.1. At the same time foreign exchange reserves have been built up.

According to some preliminary cross-country work on the determinants of sovereign credit spreads over the period 1994 to 2004, this reduction in mismatches has had a statistically significant effect in narrowing credit spreads. The implication of

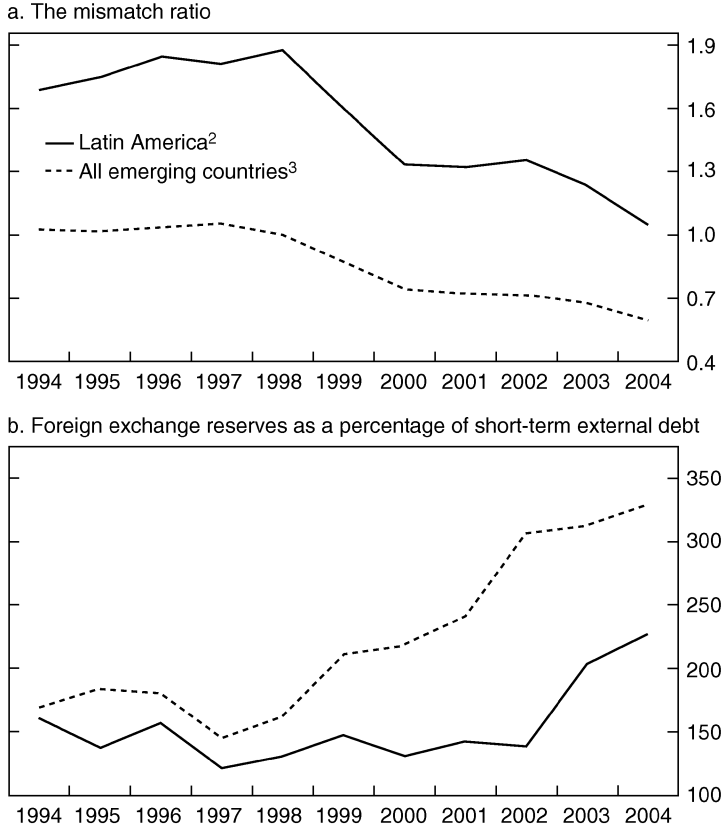

Figure 12.1 Currency mismatches and reserves coverage ratio[1]

1. Simple averages. 2. Brazil, Chile, Colombia, Mexico, Peru and Venezuela. 3. Latin American countries cited plus China, the Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, the Philippines, Poland, Russia, South Africa, Thailand and Turkey.

Sources: BIS; Goldstein and Turner (2004) updated (details available from philippe.hainaut@bis.org).

this finding is that lower mismatches do indeed improve a country's standing in international capital markets.

Another significant variable was forex reserves as a percentage of short-term external debt, shown in the lower panel of Figure 12.1. Increases in this ratio – a proxy for liquidity – also led to lower credit spreads. The implication of this is that large aggregate liquidity buffers can help protect dollarized economies. This seems to explain why Peru, one of the most highly dollarized economies in Latin America, weathered regional financial turmoil rather well. Substantial official reserves and the liquid foreign assets of the banks were in effect the country's insurance policy.[6]

12.3 Is there foreign interest in Latin American local currency bonds?

A question for the future is this: what is the likely appetite of foreign investors for Latin American local currency debt? An important distinction is between international bonds and local bonds. Each must be considered in turn.

International bonds

Should governments issue international bonds in local currency? Perhaps not. It is possible that liquidity in international bond markets and the ability to fully exploit new instruments (e.g., CDCs) requires concentration on just a few currencies. Whatever the reason, the great bulk of international bonds are, in fact, issued in just two currencies: 43 per cent in US dollars and 41 per cent in euros.[7] These currency percentages are much more concentrated than, say, the US or euro-area's share of world GDP. This is presumably because investors value the liquidity of these markets. Spreading over additional currencies would almost certainly dilute liquidity.

It is true that recently there have been (or will soon be) some highly publicized issues by Latin American borrowers. But some of these issues seem to be either very special (e.g., related to debt restructuring) or have complete or partial exchange rate mitigants. This issue merits further analysis.

Domestic bonds

What about domestic bonds? Foreign investors may still be interested in local currency bonds issued in local markets by Latin American entities. Bond markets *are* developing in depth in several countries. Domestic debt securities of Latin American entities amounted to about $270 billion at the end of 1994; by the end of 2004, outstandings had risen to $650 billion.

The development of a long, well-defined yield curve in Mexico has been particularly striking.[8] While there has been relatively little research on Latin American bonds, recent work at the BIS suggests that Asian local currency bonds can be very attractive to foreign investors. First, the standard analysis of returns and variance suggests that Asian local currency debt provided foreign investors with a lower risk alternative to dollar debt. The mean return on a portfolio of local currency bonds was only a little lower than dollar-denominated funds but the variance was much

lower.[9] Second, the covariance between a portfolio of local currency bonds and a standard global portfolio is low. Hence, local currency bonds offer valuable diversification benefits. And there is some evidence that correlation remains low, even in periods of stress – so that diversification benefits tend to be rather resilient and survive even 'bad' times. An important question is: what will be the properties of local currency bonds in Latin America? It is too early to say. The experience of Asia is encouraging, even if foreign portfolios are still dominated by a few countries.

There is no comprehensive information on foreign investor holdings of domestic bonds. Nevertheless, sustained increases in the share of domestic bonds in the total volume of trading by international financial intermediaries reported by the Emerging Market Trading Association suggests that non-residents have become more involved in domestic bond markets in emerging economies.

This important development forces policy-makers to pay attention to the quality of their own local bond markets – the infrastructure, tax arrangements, the investor base and so on. Monitoring the vulnerabilities that arise from such debt requires better data on maturity and on interest rate linking than exist in many countries. How vulnerable domestic debt is to changes in the interest rate cycle requires more attention than it has received to date.

Notes

1. This chapter draws on Morris Goldstein and Philip Turner (2004). The views expressed here are my own, not necessarily those of the BIS.
2. See Eichengreen, Hausmann and Panizza (2003).
3. A major part of IMF surveillance should be to keep a close watch on forex exposures. They should do this both *quantitatively* – helping to improve statistical coverage and cross-checking with creditor data – and *qualitatively* – satisfying themselves that local regulators have the means to monitor mismatches and are indeed doing so.
4. The BIS Committee on the Global Financial System has recently published a comprehensive assessment of the impact of increased entry of foreign banks in emerging economies. See Committee on the Global Financial System (CGFS) (2004 and 2005).
5. IMF (2004).
6. Christian Keller makes this argument very effectively in IMF (2004), pp. 42–5. He shows that Peru's official reserves plus banks' liquid foreign assets have consistently covered two-thirds to three-quarters of the sum of the country's short-term external debt and domestic dollar deposits.
7. Another 12 per cent in sterling or in yen. The Swiss franc, Canadian dollar and the Australian dollar have only 1 per cent each. These averages are for 1999 to 2004.
8. See the papers on debt markets in Brazil, Chile, Colombia, Mexico and Peru in BIS (2002).
9. Similar findings are reported by Booth (2003) and McCauley (2004).

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13
Round Table: Policy Options and Strategies for Dollarized Economies

Agustín Carstens (Chair)

After glancing through all the material that has been presented, I am fully satisfied that the situation has been very well diagnosed; and that the origins and manifestations of dollarization, the problems in dealing with it and what to do with it in the future have been discussed thoroughly. However, I have the impression that the need for fiscal discipline has not been stressed enough, and I believe that a very important problem in Latin America is that – perhaps with the sole exception of Chile – we have not been able to truly establish a believable fiscal policy for the medium term. Furthermore, the subject of fiscal dominance over monetary policy weighs heavily in many of the region's countries, including dollarized ones. Another aspect that may have been mentioned, but perhaps not as emphatically as it should have been, is that over the past 30 years Latin America has been engaged in a very profound intellectual and practical debate over the relationship between the exchange rate and competitiveness. Some of the papers do refer to it, such as Chapter 2 by Alain Ize, but I believe it is also very important at the end of the day to emphasize how to gain competitiveness without relying on the exchange rate. These structural reforms are very important and we should not lose sight of them.

For that reason I would like to ask the panelists if they could please address the following question: what can be done about de-dollarization, without setting aside the two problems I have mentioned, which are the lack of true fiscal consolidation and the lack of good competitive structural reforms?

Leonardo Leiderman

The process of de-dollarization in Latin America is already in place: dollarization is declining as an endogenous response to a more disciplined fiscal and monetary policy. The indicators for different countries that were presented at this conference clearly show the existence of this trend, with Peru providing a leading example.

We have seen in recent years that even highly dollarized countries have been able to bring inflation down to international levels, and some have even established inflation-targeting regimes. Peru's case illustrates how an effective monetary

policy can be implemented within an inflation-targeting scheme in this kind of environment. In this case, monetary policy basically uses two main instruments: the policy interest rate and foreign exchange market intervention. Since a dollarized economy can be highly vulnerable to large exchange rate shifts, both these instruments are typically set having the inflation target as a primary objective, but attempting to do that while smoothing the exchange rate path.

One area in which I believe the consensus is strongest is prudential regulation. While the papers presented at this conference clearly reveal that much remains to be done in this area, once again Peru offers a good example of the measures that could be adopted in other countries with similar experiences and also of those measures that remain to be adopted. In that sense, it would be useful to know more about the type of measures that the International Monetary Fund and other international organizations can propose to address the issue of prudential regulation in dollarized economies.

Monetary policy efficacy has been questioned under dollarization. One way to proceed in this regard is to enhance policy effectiveness by helping deepen the market for local currency-denominated assets, with maturity horizons as long as possible. Obviously, this task would not have been feasible under the previous conditions of high inflation and weak policy credibility. A question that has come up in this context is whether such a nominalization has to be accompanied by the development of a local CPI-indexed bond market.

Our discussion of the experiences of several countries at the last session showed that while introducing a market in indexed bonds can be useful to build up credibility, at the same time it may lead to a loss of some monetary policy flexibility. In particular, the experience of Chile and Israel with indexation suggests that it was very useful especially at times of high and variable inflation. Yet its mere existence, attenuating the negative effects of inflation on agents' portfolios, may have given weaker incentives to the monetary authorities to effect a disinflation.

Interestingly, we have seen in recent years advanced countries that promoted indexed bond markets. A quick glance at what is happening on Wall Street reveals that many investment banks are opening trade divisions to focus on these new instruments. Overall, I conclude that while developing a domestic market in indexed bonds can enrich the asset menu and can result in a decrease in the degree of financial dollarization, the ultimate key step for enhancing monetary policy effectiveness is to develop markets in domestic nominal assets.

Another key topic that came up in this conference is the use of foreign exchange intervention as an additional policy instrument to achieve the inflation target in a dollarized economy. Evidence was provided that Peru implements an inflation-targeting regime that takes into account the risks of dollarization and thus partially relies on foreign exchange market intervention to smooth out exchange rate fluctuations. While the experience of other countries with inflation targets, like Israel, Chile, the UK and New Zealand, suggests unsatisfactory results from foreign exchange market intervention, I believe that the latter cannot be ruled out under high dollarization. Accordingly, under these conditions a monetary authority faced with, say, a sudden stop in capital inflows that endangers achieving the

inflation target could lead to a policy response consisting of a mix of an interest rate hike and sales of foreign exchange out of international reserves. Clearly, there is need for an analytical framework that considers all these issues within an inflation-targeting framework.

To conclude, I would say that I view the de-dollarization that is taking place in countries such as Peru as a gradual endogenous process, in which agents learn more and more about the new low inflation and more stable conditions. Even so, however, I feel there is room for promoting this process. That is, it can be somewhat risky to wait for the process to occur spontaneously. Considering that de-dollarization is under way, we have mentioned above that encouraging the development of local debt markets is a way to speed up this process. This is happening in Peru today, where seven-year nominal (local currency) debt instruments are being issued – something unheard of only three, four or five years ago. It is also important to encourage the development of a market for derivatives and to contribute to a transition towards a more flexible exchange rate.

Markus Rodlauer

I think we have made a great deal of progress on understanding dollarization, its causes and possible remedies. Let me speak briefly about where I see the main lessons from past experience, and then go on to where we find ourselves today and the main challenges ahead.

Generally speaking, this conference has revealed a consensus on several aspects. Institutional aspects are key for understanding the causes of dollarization and, thus, also for its remedies. And we must investigate carefully why monetary policy suffers from a lack of credibility – fiscal problems were revealed during the debate as being one of the main reasons for such lack of credibility. Fear of floating is another subject that must be given more careful study.

Regarding the imperfections of the financial sector, it was interesting to hear that just eliminating the regulatory bias against the peso may not be enough to level the playing field. As I understood it, the authors see a basic problem of coordination in achieving de-dollarization. Striving for good policies may not be enough to produce de-dollarization because there is an endogenous vicious circle involved: bad policy produces dollarization, which in turn produces bad policy. Coordination is needed in order to break through towards a new equilibrium without dollarization. This has led some countries to resort to fairly drastic administrative measures in order to de-dollarize. Looking at the experience of these cases, it is still too early to judge whether the desired results have been attained through good policies or whether indeed more aggressive action was needed. I guess the key question is how to achieve and maintain sound monetary policy, and thereby gain monetary credibility. While administrative measures to contain dollarization may help, the crux remains the underlying macro situation and the main institutions that support it.

As for the progress made in these areas, I agree with Leonardo Leiderman and Klaus Schmidt-Hebbel. Klaus underscores the progress that has been made, and this

is certainly one of the points we at the IMF have recognized and made public. Two areas of progress are particularly noteworthy: fiscal discipline and price stability. In the fiscal area, public sector balances, as a per cent of GDP, have improved notably over the past five to ten years in Latin America. Inflation has also been kept stable, reflecting growing consensus on the need for independent central banks and well-supervised financial sectors.

The outlook for Latin America is quite favourable, but we must not lose sight of the risks ahead, such as oil prices, world interest rates and global imbalances, which could affect the region's short- and medium-term prospects. In this connection, the improved monetary policy frameworks – which have achieved broadly favourable results so far – will likely be tested more seriously during the coming period, and perhaps this will be the test that will establish its lasting credibility. I think the main point here is that we should focus our efforts on using today's good times, when reforms are easier to implement, to prepare ourselves for the bad times. One priority that been mentioned repeatedly in this context is the need to further build up the central banks' independent monetary policy functions and supervisory tasks. It is easier for a central bank to act independently, and entrench its institutional strengths, when there are no difficult and controversial policy decisions to take. And supervisors can develop their institutional strengths and establish their independence more easily when they do not have to go around closing down banks.

A couple of additional comments. I think it is good advice to move away from a fixed exchange rate, particularly as countries become more integrated into global financial markets. We at the IMF have supported such greater exchange rate flexibility and, indeed, Latin America has made impressive progress here from the situation just a few years ago. At the same time, we have also consistently taken the view that policy implementation needs to take into account specific country circumstances. For example, for countries with relatively low reserves, it makes sense to use opportunities to boost reserves during times of strong external positions. For example, it was reasonable for Peru to accumulate reserves, within the context of its inflation targeting regime, in the years following the crisis. However, in implementing this policy care must be taken to preserve adequate exchange rate flexibility and not to slide back into a position of undue rigidity – which in turn would risk creating adverse incentives and expectations (leading, for example, to build-up of currency mismatches) that add vulnerabilities and rigidity. One way of combining reserve accumulation with appropriate exchange rate flexibility is to predetermine, and possibly preannounce, target levels of reserve accumulation over a reasonable time horizon, and letting the exchange rate float around this path depending on the daily shocks and fluctuations in the market.

Juan Antonio Morales

The comments on dollarization that I am about to express, although they are not directly related to Bolivia's case, obviously reflect the Bolivian experience. I would like to start by saying that it is important not to lose sight of the main reason for wanting to de-dollarize. If the reason is to make monetary policy more effective,

then the answer to de-dollarizing should be 'no'. Obviously, it is impossible to have an independent monetary policy in a dollarized economy or, more precisely, the area of manoeuvre for an independent monetary policy is extremely limited in this case, but this does not preclude effective inflation control. For years, countries have maintained exchange rate anchors (dollarization is an extreme case) that have been able to stabilize inflation and, more broadly, the macroeconomy. The true problem with dollarization lies in the vulnerability of financial systems, and the liquidity and solvency risks that may be created by strong exchange rate movements, particularly when a sharp devaluation or depreciation occurs. The question then is whether de-dollarizing is the only possible way to reduce these risks. The answer is once again 'no' – at least in theory. If our domestic markets were more complete, deeper, and if our economies were more integrated with the international market, it would probably not even be necessary to talk about de-dollarizing. On the contrary, in order to integrate better with international markets, dollarization should be promoted even further. But this is not a realistic alternative for many of our small economies, and for that reason I will return to the main issue, which is de-dollarization.

De-dollarization involves a series of measures:

- A truly flexible exchange rate is needed.
- Monetary policy credibility is absolutely essential: both inflation rates and expectations of inflation must be kept low permanently. In order for that to be possible, the credibility of fiscal policy is of paramount importance, for if agents expect a worsening of the fiscal situation and a monetization of the deficit in the future, they will lose confidence in the local currency now. An independent central bank enhances the credibility of low inflation but it is not enough: it has to be shouldered by fiscal policy.
- It is important to create a market with sufficient depth in local currency assets. It is up to the government, obviously, to promote the initiative by issuing local currency paper. In order for the initiative to be successful, a credible fiscal policy must be in place. Neither the public nor the financial markets must see any sign at any time that the government may be tempted to reduce the real value of its debt through inflation.
- It is also important to have a good level of international reserves, but it must be kept in mind that an excessive level will only fuel dollarization.
- Changes must be made in banking regulation, so that the banks and the public internalize the risks of dollarization without transferring them to the government, inasmuch as the problem of moral risk is always present. Banking regulation, which is apparently blind to the currencies involved, ends up favouring – at least that is what the public thinks – holders of dollar-denominated assets. For instance, if a bank is liquidated, people have the impression that their dollar deposits should be given priority over local currency deposits; and that, I think, is very important in understanding existing dollarization levels. However, while it is true that de-dollarization is highly important, it must not be achieved at the expense of the development of financial markets. Many countries have had to resort to dollarization in order to develop their financial

markets, and if de-dollarization is going to reduce financial intermediation, then it is not worth pursuing.

In conclusion, I would like to mention one issue that I think we have gone over a little too rapidly. I believe that financial dollarization cannot be separated from payments dollarization and real dollarization. In fact, in my opinion, payments dollarization leads to the emergence of a parallel monetary system that obviously facilitates financial dollarization. In the case of real dollarization, there are some questions that require further explanation. How is it that wages, which can represent 40 or 50 per cent of a country's national income, are not dollarized, but at the same time the prices of some low-value items are given in dollars? In Bolivia, wages (an important sector) are not dollarized, as a general rule, yet the price of some relatively cheap items, like the football team's sweatshirts sold by my grandchildren's school, are given in dollars (some are even domestically produced). Why? What explains this segmentation of markets by currency? We do not have answers as yet and only conjectures can be provided. One of them is related to the low price elasticity of the demand for some goods and services. Obviously, setting prices in dollars also contributes to financial dollarization. If I have to pay for some goods, my rent or mortgage in dollars, then I will necessarily have to save in dollars, which only fuels dollarization.

Renzo Rossini

Financial dollarization in Peru has declined 16 percentage points over the past four years to 54 per cent – the dollarization level of twenty years ago (see Figure 13.1).

However, payments dollarization, as Figure 13.2 shows, is relatively low: most registered transactions in cash and by cheque, debit, credit and ATM cards in the payments system are made mainly in local currency.

This fact reveals that dollarization in Peru is basically an asset dollarization. Drawing on this data, I would like to describe this situation and discuss what policy responses may be needed to address it.

In the first place, when the financial system started to remonetize following the hyperinflation that ended in 1990, the liquidity risk was what worried us the most, as remonetization was in dollars and we realized that the major risk was obviously

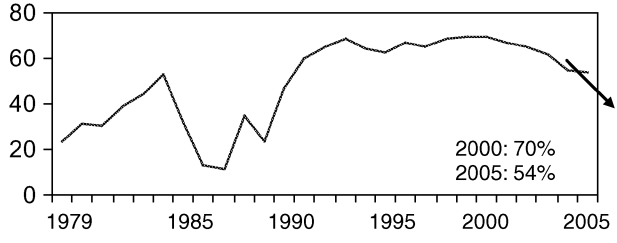

Figure 13.1 Peru: financial dollarization ratio*

* Broad money.

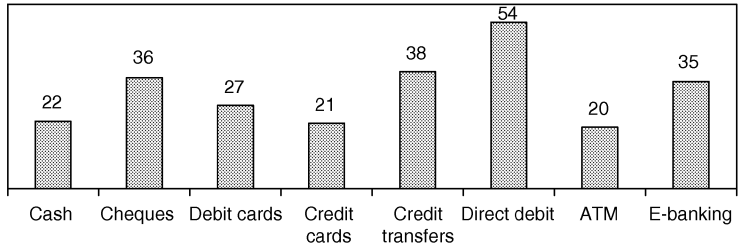

Figure 13.2 Peru: dollarization ratios in the payments system

being unable to act as the dollar lender of last resort. In this regard, a high dollar reserve requirement of 50 per cent was set at the beginning – and has been gradually reduced to its current level of 30 per cent. We have always been attentive to dollarization because of the danger of having to take over or support a bank faced by massive withdrawals of deposits in dollars.

It should be added that a policy was adopted to remunerate the required legal reserve at rates below the market. By way of example, the remuneration rate today is LIBOR minus 3/4, to penalize dollar intermediation. The intention was actually to penalize the deposit rate of interest and raise the lending rate as the required reserve and its remuneration created a margin over the interest rates. In addition, a liquidity requirement over all short-term dollar liabilities was applied to banks by the banking supervisor. An aspect of basic importance is if there are contingency plans to cover an eventual run – and it is not yet clear whether they are fully developed. The fact that banks have sufficient liquidity is not enough to prevent a crisis, since they may cling to that liquidity as their most prized possession and, despite having enough, become panic-stricken and cut off the payments chain. We experienced this sort of scenario in Peru in the second quarter of 1998.

As for the quality of balance sheets and the conditions for preventing them from being affected, Peru has a prudent international reserve policy and is introducing a new credit risk provisioning scheme – a 1 per cent provision can be established if a bank is unable to prove that it has implemented appropriate prudential measures. This can still be insufficient since, for example, mortgage loans with state guarantee have been exempted from this requirement. As 99 per cent of mortgage loans in Peru are in dollars, it would be better, in my opinion, to apply provisions also to government-supported mortgage loans.

As for the local capital market, what we are seeking through de-dollarization measures is to facilitate long-term financing protected from exchange risks. Peru's experience with Treasury bonds, as Leonardo Leiderman mentioned, has been quite successful in this connection, and I think the reason for this is also because it was carried out simultaneously with the adoption of an inflation-targeting regime. This regime reduced the variability of interest rates to a minimum, and the Treasury expanded its placement of bonds with nominal interest rates to seven years and of indexed bonds to up to 30 years. I believe this is a significant improvement that has allowed companies to follow in the Treasury's footsteps.

Another field of action is to reduce the legal incentives to use dollars in the payments system. Hysteresis can still be found, since the public continues to defend itself against the risk of inflation despite a rate below 2.5 per cent. For example, a recent law has established that prices have to be set in local currency, as part of the consumer defence policy. People decide to save in dollars because they buy durable goods with prices set in dollars. When this policy was implemented, prices began to gradually be set in soles. It will take some time for people to start to think in terms of soles for both the prices of durables and their savings. Another area of possible action is the elimination of regulations that entitle service companies to request payments with dollar bills instead of domestic currency.

I would like to conclude by stating that, in my opinion, an inflation-targeting regime can be applied in a dollarized economy. I believe the central bank's decision to determine its policy stance on the basis of projected inflation – a decision the private sector seconds – is a major step forward. Exchange rate intervention is not at odds at any time with monetary policy because, first, it does not alter the interest rates on which the central bank acts and, second, neither the private sector nor any analyst considers it as being indicative of the monetary policy stance. In short, exchange rate intervention does not confuse people, does not confuse the market and does not indicate a shift in monetary policy.

Francisco de Paula Gutierrez

Conferences of this kind, which offer a good mix of academia, policy options and experiences, give one a huge number of issues to reflect on. I arrived here far more at peace than I leave, in terms of the challenges to be faced as a country.

Allow me to share some thoughts about our case and the policy options we are analyzing. Let me first give you a thumbnail sketch of Costa Rica's economic outlook today. The economy is extremely open, with exports plus imports representing about 100 per cent of GDP; it is an economy with a capital account that has no restrictions whatsoever, with a private banking sector that started out as 'offshore banking' but has gradually become 'onshore', and now constitutes 50 per cent of the total banking sector; an economy that is partially dollarized – 50 per cent of the private sector's financial wealth is dollar-denominated. The state-owned banking system is responsible for a large percentage of the local currency loans and deposits, while the privately owned banking system concentrates more on foreign currency.

This characteristic of the banking sector brings up an issue that we have not discussed here – and I don't know whether it is unique to us or not – which is that the segmentation of banking markets could be a factor that prompts dollarization. The fact that the colones-denominated financial instruments market is concentrated in the state-owned banks – in part because there is a 100 per cent deposit guarantee – whereas the dollar denominated market has a strong participation of privately owned banks and also of foreign financial institutions, causes dollar-denominated financial intermediation margins to be much smaller than those in local currency. This market segmentation could induce a somewhat adverse risk selection. In other words, good loans seek the dollar market because

they can obtain much lower rates than risky loans. Banks are then forced to try to recover part of their positions by raising the intermediation margin even more on local currency loans. This is a process worth studying.

Costa Rica is an economy with a persistent fiscal imbalance and with central bank quasi-fiscal losses. In this sense, and using Leonardo Leiderman's comment, we have a monetary problem, given our fiscal situation. Last year, the consolidated fiscal deficit reached 3.5 per cent of GDP and the central bank deficit 1.4 per cent of GDP. The bank has a negative net worth, which means that we must somehow finance the bank's losses through inflationary inorganic money emission. Inflation has held steady at around 10 per cent over the past five years, with a standard deviation of 1.4 per cent over that period – a rather steady, but high, inflation produced by the need to finance the Central Bank's losses and also, in part, as a result of the twenty-year use of the crawling peg system. By keeping the real exchange rate highly stable over time and giving economic sectors certain, or many, guarantees, this system has been highly successful in avoiding financial crises. But, basically speaking, the cost of this credibility is reflected in our dollarization and in the limited space available for economic policy manoeuvre.

It is quite clear to us that we must confront and correct these policies. Perhaps the first element to be considered is that, in order to reverse dollarization, or to move ahead with de-dollarization, we must first remove its causes. We are not willing to place restrictions on capital movements or on holdings of foreign currency accounts, but we must eliminate the elements that are causing the problem, one of the very first of which is fiscal. We think that unless we solve the fiscal problem, particularly the problem of the Central Bank's losses, it will be very hard put to do away with the 'crawl'. I listened with envy today to experiences in approving fiscal reforms in only fifteen days or in one month. After more or less three years of discussions, we are now in the final stage and hope to be able to resolve the matter of our fiscal reform within the next two months. This fiscal reform would allow us to increase revenues by about 2 percentage points of GDP, which, in accordance with our negotiations with the Finance Ministry, would be used mostly to capitalize the Central Bank.

This would allow us to announce, with credibility, that the Central Bank will no longer need to resort to inflationary money creation to finance our deficit. We could then proceed to the next step: to think about credible monetary and exchange rate policy alternatives. We have already held talks with the IMF to explore and advance in the design of a monetary policy oriented towards providing more exchange rate flexibility and achieving an inflation target regime, provided that we are able to capitalize the Central Bank.

This would be accompanied by microeconomic-type actions, such as, for example, promoting colón-indexed credit instruments, particularly for mortgages. The basic problem in the case of mortgages in colones is the shortening of the effective payment period, given the inflationary component on colones interest rates. In other words, with their cash flows people are able to buy far fewer square metres of 'house' with colones than with dollars. As a result, mortgages tend to be dollarized. This colón-indexed mortgage instrument has enabled us to make an interesting

change and the demand for its use is heavy. State-owned banks have started to standardize mortgages so that pension funds can be used to purchase this type of financial asset.

We are studying different options in the case of liquidity reserves and discussing whether or not it is worth having differentiated reserve requirements according to the currency of deposits. However, given the openness of the capital account, we are extremely concerned with regard to the transfer abroad of accounts – the reinitiation of offshorization by the private financial system. For that reason, we have moved ahead very cautiously. At this time, we have the same legal reserve requirements for dollars as for colones.

I hope that over the next few years we will be able to lay much of the groundwork that some of the countries represented here today have in place in terms of stability. Hopefully, by the time the next conference takes place, we will be able to hold up Costa Rica as a successful experience in de-dollarization or as a country that has accomplished what it had to in the area of macroeconomic stabilization.

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