Foreign Exchange Intervention in INFLATION TARGETERS in Latin America

EDITORS
Marcos Chamon, David Hofman,
Nicolás E. Magud, and Alejandro Werner

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Advance Praise

"Over the past two decades, emerging market economies throughout the world have improved their economic performance and resilience through a combination of exchange-rate flexibility and inflation targeting. Yet, strictly free-floating remains rare, and the revealed preference is sometimes to use foreign exchange intervention as an additional policy tool. When are these interventions helpful, and what practices make it more likely they will complement rather than undermine the pursuit of price stability? With a focus on Latin America, this book provides vital background to help answer these questions. It is essential reading for anyone who wants to understand how emerging economies can navigate the global financial cycle."

Maury Obstfeld
Professor of Economics at the University of California Berkley

"Emerging markets' road to development involves consolidating an open economy in terms of trade and capital flows. This requires a sound macroeconomic framework, in which a strong monetary policy anchor (such as an inflation-targeting scheme implemented by an autonomous central bank), sustainable fiscal accounts and a market-based flexible exchange rate arrangement play a key role. For this to be effective, it is critical to (i) develop a deep and liquid foreign exchange market; (ii) build an efficient regulatory framework aimed at increasing financial and corporate foreign exchange resilience (which often constrains policy alternatives); and (iii) consider foreign exchange interventions and capital flow management measures as exceptions, to be used only when distortions could compromise an adequate foreign exchange price discovery process and not to target any foreign exchange level. In this context, this book is an invaluable contribution to the analysis of experiences of Latin American countries regarding the evolution of their foreign exchange policies. Overall, the region has made progress in developing their financial markets and adopting stronger foreign exchange regimes."

Alejandro Díaz de León
Governor of the Central Bank of Mexico

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Changes were made to the PDF of this book after publication (Chapter 8, pp. 122, 128, and 135) to correct omitted callouts to a reference.

Foreword

Latin America has explored many different exchange rate arrangements over the history of the Bretton Woods period. The International Monetary System established by the 1944 Bretton Woods agreement was based on fixed but adjustable exchange rates. In those days, frequent foreign exchange intervention was simply a mechanical consequence of the choice of an exchange rate regime. Starting in the 1970s, however, advanced economies moved to more flexible exchange rates. At the same time, many developing countries sought to maintain fixed regimes to provide stability and control inflation, though not always successfully. Since the 1990s, sometimes in the aftermath of currency crises that highlighted the drawbacks of prior pegged regimes, most large Latin American economies have transitioned to inflation targeting. By construction, an inflation-targeting framework requires exchange rate flexibility. It is thus no longer clear what role—if any—foreign exchange intervention should play.

In practice, inflation-targeting central banks in emerging markets have continued to closely monitor the exchange rate, not only because of its implications for inflation, but also because of financial stability risks that sharp exchange rate movements may entail. For the most part, foreign exchange intervention has continued to be a widely used instrument in the toolkit of policymakers in these countries. Despite this widespread use, our understanding of many aspects related to this tool remains limited. In that setting, the wide variety of approaches taken by Latin American countries provides a wealth of experience for study and analysis.

Building on a comprehensive review of the evidence and practices related to foreign exchange intervention in Latin America, this new book compares country experiences and facilitates the policy discussion. Analytical chapters written by IMF staff review the main themes that emerge from the experience. Expert staff from seven key central banks in the region contributed chapters that review in more detail the goals, modalities, evolution, and outcomes of intervention policies in their respective countries.

This book documents why and how Latin American policymakers have continued to intervene in foreign exchange markets and how they have reconciled this with the primary goal of inflation targeting. Their experience is diverse, and several aspects require further research. Yet, key central themes that emerge are the importance of transparency and strong communication policies, as well as the benefits of rules-based intervention observed in the largest economies. These have arguably helped central banks in the region to strengthen the effectiveness of interventions and preserve the credibility of their monetary policy regimes. This book offers a wealth of information for central banks, including those outside the

region, and for anyone else interested in learning from the Latin American experience. I hope you will find it useful.

David Lipton
First Deputy Managing Director
International Monetary Fund

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Abbreviations

2SLS	two-stage least squares
ADF	augmented Dickey–Fuller
ALMD	Assets and Liabilities Management Division
ARA	Adequacy of Reserves Accumulation
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
BCCR	Central Bank of Costa Rica
BCDs	Central Bank of Chile dollar-denominated bond
BCU	Banco Central del Uruguay
BIS	Bank for International Settlements
Ch	Chilean
CIP	covered interest parity
CPI	consumer price index
CSR	cost of the surplus reserves
CUE	continuously updated estimator
DIR	direct intervention
DUS	trade-weighted nominal exchange rate index for the United States
ECB	European Central Bank
EGARCH	exponential generalized autoregressive conditional heteroskedasticity
EMBI	Emerging Markets Bonds Index
FRED	Federal Reserve
FX Commission	Foreign Exchange Commission
G3	Group of Three
GARCH	generalized autoregressive conditional heteroskedasticity
GC	*gobierno central* (central government)
GDP	gross domestic product
IBR	inter-bank rate
INDIR	indirect intervention
IRFs	impulse-response functions
ITLUP	Uruguayan peso-nominated yield curve
IV	instrumental variable
LA5	Latin America 5
M1	Monetary Target
MONEX	Mercado de Monedas Extranjeras
MXN	Mexican peso
NBER	National Bureau of Economic Research
NDFs	nondeliverable forwards
NFXP	net foreign exchange purchases
NSSc	nonstatistically significant results

OECD	Organisation for Economic Co-operation and Development
OLS	ordinary least squares
PEMEX	Petróleos Mexicanos
RECOPE	Refinadora Costarricense de Petróleo
S.D.	standard deviation
S.E.	standard error
SC BCRP	Swaps Cambiarios del Banco Central de Reserva del Perú
SDRs	Special Drawing Rights
SELIC	Sistema Especial de Liquidação e Custo
SELIC	Sistema Especial de Liquidaçãoe Custo system
SR	surplus reserves
STER	sterilized
SVAR	structural vector autoregression
TES	títulos de tesorería (Treasury bills in Colombia)
TRM	*tasa de cambio representativa del mercado* (representative market exchange rate)
UIP	uncovered interest parity
USD	US dollar
UY peso	Uruguayan peso
VAR	vector autoregression
VIX	Volatility Index

CHAPTER 1

Introduction: Book in Brief

Marcos Chamon, David Hofman, Nicolás E. Magud, and Alejandro Werner

There is a growing interest in the use of foreign exchange intervention as a policy tool, particularly in emerging markets. Yet our understanding of many aspects of foreign exchange intervention remains limited, especially in countries with flexible exchange rate regimes. To contribute to the discussion, this book examines the experience of several key inflation-targeting central banks in Latin America.

Most Latin American countries have adopted floating exchange rate regimes in the past two decades, often in combination with a move to inflation targeting. Still, official intervention in foreign exchange markets has remained an important feature of policy frameworks. Many countries in the region have steadily accumulated reserves as they have leaned against sustained capital inflows, first in response to the commodity super cycle, and then as advanced economies responded to the global financial crisis with a large monetary stimulus. In some cases, countries have also deployed those reserves to counter depreciation pressures.

The modalities of such interventions, however, have varied widely. In some cases, interventions took place under a clearly laid-out framework and defined set of rules; in others, intervention was more ad hoc and discretionary. Often, intervention took place directly in spot markets and was aimed at accommodating immediate foreign exchange liquidity needs. But in some episodes, pressures in foreign exchange markets were due to hedging demand, and intervention was carried out through derivatives.

Although inflation-targeting central banks in Latin America, on average, tend to be relatively transparent about their interventions, countries' disclosure practices have differed considerably, both across countries and over time.

The Latin American experience with foreign exchange intervention is of interest because it provides insights into several key issues faced by policymakers in many emerging economies. In particular, what is—or should be—the role of interventions under a floating exchange rate regime and of inflation targeting? What are the motives for interventions under such regimes? How effective are foreign exchange interventions? Indeed, do they work at all? How should they be best conducted? And what are the costs of interventions?

To help answer these questions, this book provides the reader with an up-to-date review of foreign exchange intervention practices in Latin America

and distills tentative lessons from this rich and varied experience. Building on evidence and country experience with intervention, the book aims to provide a consistent analytical framework to facilitate policy discussion.

The first part of the book covers the main thematic issues in a set of analytical chapters prepared by IMF staff. The chapters provide a broad cross-country perspective of the motives and means of intervention, by exploring the different frameworks, instruments, and operational and implementation issues. It also reviews the existing literature on the effectiveness of interventions, including a chapter that presents new evidence on the effectiveness of forward intervention. This first block of background chapters concludes with a detailed discussion of the operational challenges of foreign exchange intervention under inflation-targeting regimes.

In the second part of the book, chapters by staff of the central banks of Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, and Uruguay provide insightful narratives, as well as specific details of each country's individual experience. Topics include the developments that motivated intervention—ranging from mitigating the risks of financial dollarization (Costa Rica, Peru, and Uruguay) to managing the impact of large and sustained capital inflows and their often-sudden reversals (Brazil). Topics also include the specific modalities of interventions and their short- and medium-term effectiveness in achieving policy goals.

The chapters also describe the process with which central banks decide how and how much to intervene—in some cases presenting an illustrative intervention decision tree—and how communication around interventions takes place. One key message from the accumulated experience of inflation-targeting Latin American countries is a strong preference for transparency when intervening. Transparency can allow the market to internalize the reaction function of the central bank, helping to reduce excessive exchange rate volatility and uncertainty.

The following overview briefly summarizes each chapter.

Chapter 2 begins with a focus on intervention motives. Marcos Chamon and Nicolás E. Magud briefly review the theoretical literature on foreign exchange intervention and then explain why central banks may decide to intervene. Intervention plays a central role in fixed exchange rate regimes. However, in a floating regime (the focus of the book) the role of intervention is not clear. Yet, there are several reasons why central banks intervene. The motives for intervention include international reserve accumulation for precautionary reasons, attenuating financial stability risks from sharp exchange rate movements, managing short-term/high-frequency shocks on the exchange rate as a result of inflation pass-through concerns, and managing more persistent shocks or shocks to the real exchange rate due to competitiveness/Dutch disease considerations. The discussion focuses on the potential benefits from those channels, but the overall desirability of intervention will also depend on its cost.

In Chapter 3, Oscar A. Hendrick, Nicolás E. Magud, and Asad Qureshi present a taxonomy of foreign exchange intervention. The chapter discusses

several ways in which intervention takes place in practice. Specifically, it presents different frameworks in which foreign exchange intervention can be implemented. These include whether intervention is transparently communicated to the market or conducted secretly. It also considers whether intervention is rules-based or discretionary. Beyond this taxonomy, the chapter delves deeper into the motives behind each type of foreign exchange intervention, including if intervention is done in the spot market or in the derivatives market—and the motivation behind the use of each type of intervention. Throughout the analysis, the costs and benefits of these modalities are considered.

In Chapter 4, Marcos Chamon, David Hofman, Sergi Lanau, Umang Rawat, and Miklos Vari document the evidence in the existing literature of how interventions impact exchange rates. This sheds light on why central banks are often willing to incur the costs of intervention. The chapter reviews the inherent identification challenges of assessing intervention effectiveness and the empirical strategies that have been used to tackle this problem. It reviews the evidence for the effect on the exchange rate level and on volatility, and the duration of these effects. It also reviews the evidence of the relative effectiveness of foreign exchange sales versus purchases, spots versus derivatives, and rules-based versus discretionary interventions.

Chapter 5 presents new evidence of the effectiveness of foreign exchange intervention. Chris Walker examines the effectiveness of forward intervention in foreign exchange markets, employing a simple analytical framework and presenting econometric estimates for the experience with forward intervention. Its effectiveness is assessed for the impact on spot currency markets, as well as for domestic interest rates, dollar availability in domestic markets, and capital flows. The chapter provides an analytically underpinned taxonomy of the circumstances in which forward intervention may be preferred to spot intervention or to other policy measures.

In Chapter 6, Marcos Chamon, David Hofman, Nicolás E. Magud, Umang Rawat, and Alejandro Werner explore how foreign exchange intervention is integrated under inflation targeting in Latin America. The authors discuss the challenges central banks face, including (1) tensions between foreign exchange interventions and monetary policy actions aimed at an inflation target, (2) whether the responses to appreciation or depreciation pressures have been symmetric, (3) the costs of intervention, (4) the trade-offs of transparency and communication of the monetary policy objectives, and (5) intervention under currency mismatches. They find that Latin American central banks, on balance, appear to have managed these tensions with a considerable degree of success. Clear communication policies appear crucial to conveying the primacy of the inflation objective and anchoring inflation expectations.

Turning to individual country experiences, in Chapter 7, João Barata R. B. Barroso presents the case of Brazil. The author highlights that international reserve accumulation involved "leaning against the wind," which enabled the accumulation of a large buffer of international reserves to insure against potentially destabilizing situations. Intervention also enabled the Central Bank of Brazil

to offer hedging instruments at times of excess market demand. There was a significant provision of foreign exchange liquidity through repo auctions during the 2008–09 global financial crisis. Swap auctions have also been very common. Another significant episode of foreign exchange sales took place in the aftermath of the "taper tantrum" that emerged in 2013, as the US Federal Reserve announced it would eventually withdraw the monetary stimulus that had been put in place during the financial crisis. The Central Bank of Brazil intervened mostly through preannounced rules for the sale of derivatives to provide foreign exchange liquidity and to meet hedging demand. At the height of that intervention program, the outstanding volume of derivatives exceeded $100 billion. The chapter also presents a flowchart that helps explain how the central bank decides whether and how to intervene.

Catalina Larraín and Diego Saravia describe the Chilean experience in Chapter 8. Since floating its currency in 1999, Chile has intervened only four times—in 2001, 2002–03, 2008, and 2011. In the first two cases, the central bank intervened to provide foreign currency liquidity by selling US dollars and US dollar-denominated bonds. In contrast, in 2008 and 2011, preannounced programs involved regularly scheduled purchases of US dollars to reach an international reserve target. In all cases, the central bank clearly communicated the intervention programs to the public. Their results show that the announcement of an intervention program had clearer effects on the exchange rate than the actual interventions (consistent with the market pricing in the effect of the intervention in the aftermath of the announcement).

In Chapter 9, Pamela Cardozo describes foreign exchange intervention in Colombia. The Bank of the Republic intervened to accumulate international reserves to reduce external vulnerabilities, to mitigate fluctuations in the exchange rate that do not clearly reflect fundamentals and that may have adverse impact on inflation and economic activity, and to provide foreign liquidity to the market to ensure normal functioning of internal and external payments. Colombia has used options to accumulate international reserves, which are exercised when the exchange rate is below its 20-day moving average. This rule led to stronger reserve accumulation at times of appreciation pressure. Options were also used to implement analogous rules for selling foreign exchange during times of depreciation pressure. The central bank has also undertaken discretionary interventions. The chapter provides a decision tree to illustrate how the central bank decides to intervene.

In Chapter 10, Rodrigo Cubero, Valerie Lankester, and Evelyn Muñoz look at Costa Rica. This is a much more dollarized economy than others covered in this book—it only started to officially float its currency in 2015. The country is also fairly open to international trade and finance. As a result, the Central Bank of Costa Rica frequently intervenes to maintain financial stability, "lean against the wind," and avoid excessive volatility in the exchange rate. Managing the supply and demand of foreign exchange by the various public entities is also an important consideration. All interventions in Costa Rica are conducted through the spot market, because derivatives markets are not well developed. These

interventions are discretionary, with no formal intervention rule communicated to the public.

Chapter 11 presents the case of Mexico. Rodrigo Cano, Daniela Gallardo, and Jaime Acosta highlight the Bank of Mexico's independence in instruments and objectives. Interest rates are only used for responding to inflation deviations from target, while foreign exchange interventions seek to mute excessive exchange rate volatility and accumulate reserves for precautionary reasons. Most interventions have taken place through preannounced programs. Reserve accumulation has been achieved through put options and following specific rules, similar to Colombia. Some rules also involved steady daily foreign exchange sales. Though less common, outright discretionary sales of US dollars have been used under extreme conditions. More recently, the Bank of Mexico has been using foreign exchange hedge auction programs (nondeliverable forward auctions) to meet market hedging needs while preserving reserves. The central bank clearly communicates intervention rules, and the markets and the public are kept informed of their implementation.

In Chapter 12, Adrian Armas and Marco Vega discuss foreign exchange intervention in Peru. The authors stress that the high degree of financial dollarization calls for active foreign exchange intervention to mitigate exchange rate volatility and potential balance sheet effects. Intervention in Peru is essentially discretionary. The Central Reserve Bank of Peru accumulates sizable reserves during tranquil times so it can comfortably deploy them if needed. Operations in the foreign exchange market are done through both spot and forward markets. Currency swaps are mostly aimed at reducing exchange rate volatility. The country's foreign exchange intervention policy appears to have been quite effective in smoothing shocks to the exchange rate, even in the case of fairly persistent shocks.

Finally, in Chapter 13, Elizabeth Bucacos, Alberto Graña, Gerardo Licandro, and Miguel Mello present the case of Uruguay. In a highly dollarized economy, the Central Bank of Uruguay intervenes frequently to reduce exchange rate volatility, which could otherwise lead to adverse balance sheet effects. Intervention also helps manage the supply and demand balance for US dollars in the domestic market, including from government entities. Uruguay is unique in its use of monetary aggregate targets instead of interest rates to achieve its inflation target.

PART I

CHAPTER 2

Why Intervene?

Marcos Chamon and Nicolás E. Magud

This chapter discusses some of the motives for why emerging market countries may want to intervene in the foreign exchange market, even under a flexible exchange rate regime. The motives include reserve accumulation for precautionary reasons, intervention to attenuate financial stability risks from sharp movements in the exchange rate, and efforts to manage the exchange rate due to pass-through or competitiveness concerns. The discussion focuses on the potential benefits of those channels, but the overall desirability of intervention will also depend on its cost.

INTRODUCTION

Foreign exchange intervention plays a central role in fixed exchange rate regimes. If a central bank is committed to maintaining an exchange rate, it must stand ready to buy or sell foreign exchange at that price. However, it is much less clear what role intervention should play in a flexible exchange rate regime. Standard macroeconomic models provide no guidance on the role of foreign exchange intervention. If anything, they suggest that intervention should not impact the exchange rate—that is, intervention would have no traction. Open economy models—dating back to Fleming (1962), Mundell (1963), and Dornbusch (1976)—typically assume perfect capital mobility. The uncovered interest parity (UIP) condition has become a cornerstone for such models. Under UIP, the expected change in the exchange rate is given by the interest rate differential, which in log form yields the familiar expression:

$$i_t - i_t^* = e_t - E_t[e_{t+1}], \tag{2.1}$$

where i and i^* denote the home and foreign interest rate, respectively, and e is the exchange rate (with an increase denoting an appreciation of the home currency). This condition implies that the exchange rate will respond only to changes in the interest rate differential or in the expected change in the exchange rate. No amount of sterilized foreign exchange purchases or sales by the central bank would affect the exchange rate. In practice, however, UIP does not hold. Even covered interest parity (in which futures are used in place of the expected exchange rate) has started to break down in practice (see Chapter 5). The literature emphasizes two main channels through which sterilized intervention (purchases and sales of foreign exchange

The opinions expressed in this chapter are the sole responsibility of the authors.

that leave the central bank's interest rate unchanged) can affect the exchange rate: the *portfolio balance* and the *signaling channels*.[1]

The portfolio balance channel works through the change in the relative supply of domestic and foreign currency assets (Kouri 1976). If both types of assets were perfect substitutes (that is, if UIP held), then that change in relative supply would not matter. To the extent that assets are imperfect substitutes, however, investors will demand a premium for holding more of the asset whose supply has increased, thus depreciating the currency of that asset. This portfolio balance channel may indeed have played a small quantitative role in advanced economies, where the magnitude of interventions was very small compared with their large bond markets. For example, the average coordinated intervention operation in support of the US dollar from January 1985 to December 1988 involved $278.5 million, while the average coordinated sale involved $373.2 million (Frankel and Dominguez 1993).[2] However, in many emerging markets, the stock of foreign exchange reserves is of a similar order of magnitude to the stock of domestic currency assets (Figure 2.1). The magnitudes involved suggest that the cumulative quantitative effects on asset prices through this portfolio channel could be significant, even if the channel has limited traction (see Chapters 4 and 5 for evidence on the effectiveness of foreign exchange intervention). Traction could also be higher if the emerging markets are not as well integrated into the global financial markets as their advanced counterparts (so that local and foreign currency assets become less perfect substitutes).

A few recent theoretical papers introduce frictions in otherwise standard models, which allow intervention to have traction.[3] For example, Benes and others (2015) present a model in which sterilized interventions lead to deviations from UIP through portfolio effects in a standard New Keynesian framework. Portfolio effects drive deviations from UIP in Gabaix and Maggiori (2015). Cavallino (2015) builds on that model to show how foreign exchange intervention can have sizable effects.[4]

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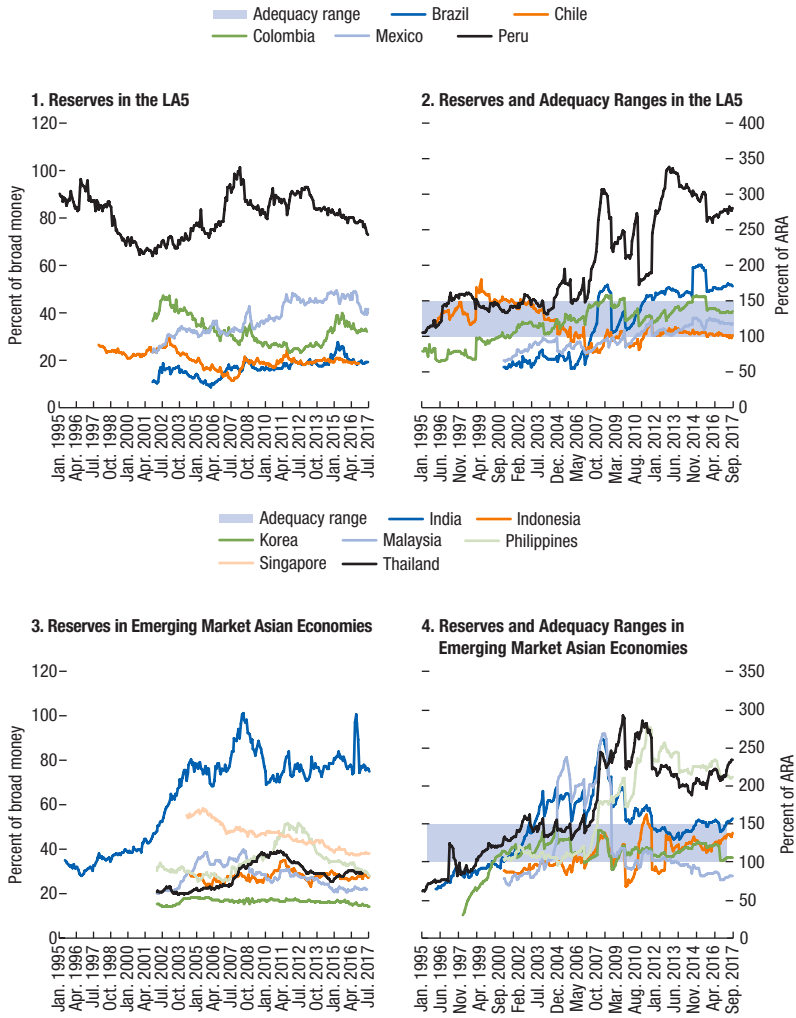
[1] Other, less explored channels exist. In the order-flow channel, the size of intervention relative to the market turnover affects price formation and the exchange rate. A related channel is the microstructure channel, which links the level of trading with that of exchange rate volatility (Frankel and Froot 1990). For sterilized interventions, Taylor (2005) suggests that the exchange rate pass-through to domestic prices decreases when the credibility of the central bank increases, reducing the need for foreign exchange intervention.

[2] One notable exception is the recent Swiss experience, where a very large stock of reserves was accumulated following the decision to place a floor on the exchange rate relative to the euro. While that policy was eventually abandoned, it showed that intervention on a massive scale is not necessarily ineffective, even in the context of a reserve currency.

[3] There are also models where the exchange rate is affected by the order flow, at least in the short- to medium-term (as discussed in Bacchetta and van Wincoop 2006).

[4] Other recent papers show a number of ways in which intervention can have an impact. For example, Garcia (2016) presents a model in which sterilized intervention causes banks to shift their portfolio from government bonds toward loans. Chang (2017) presents a model where foreign exchange intervention has traction by relaxing or tightening the financial constraints of domestic banks.

Figure 2.1. International Reserves Relative to Broad Money and IMF Adequacy of Reserves Accumulation Metric, 1995–2017



Sources: Central banks; and authors' calculations based on IMF's International Financial Statistics database.
Note: ARA = adequacy of reserves accumulation; LA5 = Brazil, Chile, Colombia, Mexico, and Peru.

Ghosh, Ostry, and Chamon (2016) present a reduced-form model that illustrates the type of frictions that can allow foreign exchange intervention to play a role. UIP implicitly assumes that capital flows would immediately move to arbitrage away any expected return differential. Suppose instead that capital flows respond to return differentials, but at a finite pace:

$$\Delta k_t = \gamma_i(i_t - i_t^* + E_t\Delta e_{t+1}) - \gamma_k k_{t-1}, \qquad (2.2)$$

where k stands for capital flows and $\gamma < 1$. Thus, the standard balance of payments equilibrium condition:

$$\Delta k\ t + \Delta Current\ Account\ t(Output, e\ t) = \Delta Reserves\ t \qquad (2.3)$$

implies that both quantities (capital flows and reserves) and prices (interest rates and exchange rate) matter. That is, foreign exchange intervention impacts the exchange rate, even if interest rates remain unchanged.[5] Despite imperfect capital mobility, the foreign exchange market can always clear, provided that a sufficiently large adjustment in asset prices brings demand and supply of foreign exchange in line with each other. However, this adjustment may require very large swings in asset prices, including the exchange rate, which may be undesirable for several reasons. Central bank purchases or sales of foreign exchange assets can help narrow the magnitude of this adjustment by reducing the amount of excess supply or demand that needs to be accommodated by the private market.

The signaling or expectation channel affects the exchange rate through a change in market expectations about fundamentals (Mussa 1981). If the central bank has more information about fundamentals (including its future monetary policy stance) than the market has, it can use intervention to signal that information. And to the extent that it signals information about the future monetary policy stance, such an intervention would have traction on the exchange rate when announced, even if UIP holds (since future interest rates would impact today's exchange rate via their effect on the expected future exchange rate).[6]

The rest of this chapter discusses four main reasons that the central bank may want to intervene. As noted earlier, these include precautionary reserve accumulation, intervention to attenuate financial stability risks, intervention on concerns of pass-through to inflation, and intervention for managing more persistent shocks.

INTERNATIONAL RESERVE ACCUMULATION FOR PRECAUTIONARY REASONS

Perhaps the least controversial motive for intervening is the need to accumulate reserves for precautionary reasons. This has gained prominence especially since the 1997 Asian financial crisis. With this motive, the central bank intervenes to build up international reserves for use if adverse conditions materialize in the future, and not to affect current developments in the foreign exchange market.

Several episodes of sudden stops or reversals in private capital flows have occurred in the past, some associated with full-fledged currency and financial crises, especially in economies with fixed exchange rate regimes. Intervention

[5] In the absence of intervention, capital inflows would finance a current account deficit, or vice versa. But if the central bank intervenes and buys foreign exchange, the balance of payments, given a capital inflow, will imply a smaller current account deficit and less exchange rate appreciation.

[6] Iterating the UIP condition forward, today's spot exchange rate is determined by the sum of expected future interest rate differentials.

during such times of distress can help attenuate overshooting and other disorderly conditions that may arise in foreign exchange markets.

Furthermore, by amassing an adequate stock of reserves, the central bank can reduce the likelihood of adverse conditions materializing in the first place. For example, investors may be less likely to flee if they have confidence that the central bank can step in and help stabilize conditions in the foreign exchange market if a sudden stop takes place. Chapter 4 discusses these and other considerations when reviewing the effectiveness of intervention.

Foreign exchange reserves are among the main indicators of vulnerability that emerge from the early-warning-model literature. Most of that literature, particularly if published before the global financial crisis, focused on assessing the vulnerability to currency crises.[7] Those currency crises were typically defined either based on sufficiently large nominal and real movements in the exchange rate or on indices of currency market pressure, which typically included reserves. The early warning models were inspired by the emerging market crises of the 1990s, such as the Mexican peso crisis of 1994. Extensive reviews of that literature are provided in Kaminsky, Lizondo, and Reinhart (1998), Hawkins and Klau (2000), Abiad (2003), and Frankel and Saravelos (2012). The latter performs a meta-analysis based on those reviews and other recent studies. Foreign exchange reserves are among the most frequent statistically significant indicators in the 83 papers they reviewed.[8]

From a theoretical perspective, reserves play a central role in currency crises models. Their depletion (because of unsustainable macroeconomic policies) is at the heart of "first-generation" currency crises models (such as Krugman 1979). The level of reserves is also a key determinant of whether a bad equilibrium can exist in "second-generation" models (such as Obstfeld 1996) and its global-game variants (such as Morris and Shin 1998). And sufficiently large reserves can in principle address the vulnerabilities created by the balance sheet effects in "third-generation" models (Aghion, Bacchetta, and Banerjee 2014).

Much of this literature focuses on how reserves can prevent a currency crisis, especially when the starting point was a fixed or tightly managed exchange rate regime. However, reserves can still bring prudential benefits, even in the context of a floating exchange rate. In principle, sufficiently large movements in the exchange rate can bring supply and demand for foreign exchange in line with each other following a shock. But large movements may involve economic costs and dislocations, which make them undesirable for several reasons. By intervening in the foreign exchange market, the central bank can reduce the excess demand or supply that needs to be satisfied by the market.

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[7] In contrast, Blanchard, Das, and Faruqee (2010), and Berkmen and others (2012) do not find a role for reserves when explaining the effect of the global financial crisis on emerging markets.

[8] The real exchange rate, the growth rate of credit, GDP growth, and the current-account-to-GDP balance are other important and statistically significant vulnerability indicators.

More generally, by accumulating foreign assets, the central bank can smooth the contraction in consumption following a sudden stop in capital flows. Jeanne and Rancière (2011) present a model in which policymakers choose a level of reserves to insure against a sudden stop. The optimal level of reserves depends on their cost, the probability of a sudden stop, its impact on output and consumption, and the degree of risk aversion. Their calibration found the stock of reserves to be adequate, on average, in Latin America, although they struggled to explain the continued rise in reserves over the past 10 years. Obstfeld, Shambaugh, and Taylor (2010) argue that higher reserves can be justified if they insure against domestic financial risks, including capital flight.

Low international reserves are typically a sign of vulnerability, in particular in economies with strongly managed exchange rates. However, the sharp depreciations observed in several Latin American countries after the global financial crisis led to neither high inflation nor to disruptive contractions, as they had in the past. Strong macroeconomic frameworks on the back of ample reserves likely contributed to this resilience.[9]

Even though the central bank may not necessarily be focusing on current market conditions when accumulating reserves for precautionary motives, it can still time its foreign exchange purchases in an opportunistic way. It can purchase its foreign exchange during periods when the domestic currency is appreciating. By leaning against the wind, it can moderate the pace of appreciation and make purchases when foreign exchange is perceived to be relatively "cheap."

Central banks in the region have pursued this strategy, including through explicit rules. For example, when Colombia and Mexico were building up their reserves, they used options with a strike price based on the 20-day moving average of the exchange rate. That helped time their foreign exchange purchases to take place when appreciation pressures were stronger. This was also the case in Chile in 2011, when authorities announced a year-long program of international reserve accumulation to match reserve-to-GDP ratios of similar countries.

The pace of prudential reserve accumulation could pick up during episodes of capital inflows for other reasons as well. If these episodes are associated with an increase in short-term foreign exchange debt, then the pace of accumulation should increase to keep up with adequacy metrics that include that type of flow.[10] The flip side of that argument is that episodes in which short-term foreign exchange debt decrease would imply a reduction in the desired prudential level of reserves. In practice, though, countries are reluctant to deploy reserves. When prudential motives abate, they tend to adjust by halting reserve accumulation, which, over time, can bring the stock of reserves in line with reduced prudential needs.

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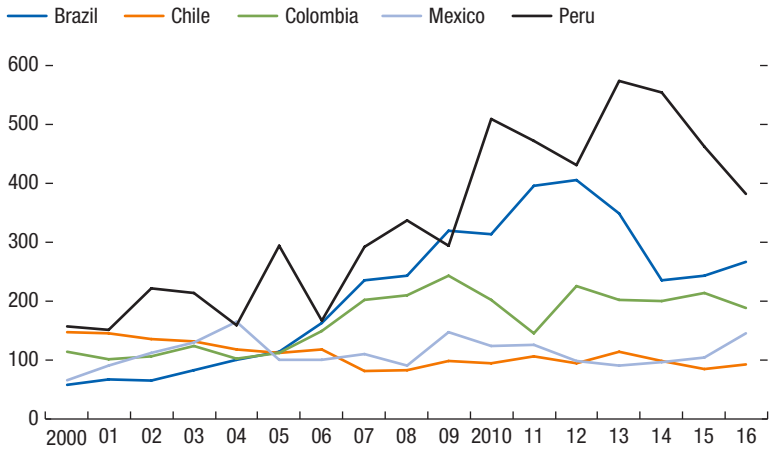
[9] For example, a large stock of reserves may assuage fears that a sharp depreciation may lead to a freely falling exchange rate (therefore, a real depreciation can be achieved with a much smaller nominal depreciation than what would have been the case in the past).

[10] For a detailed discussion of reserve adequacy, see IMF 2015.

Figure 2.2. International Reserves to Short-Term Debt, LA5 Countries, 2000–16
(Percent)



Sources: Central banks; and authors' calculations based on IMF's International Financial Statistics database.
Note: LA5 = Brazil, Chile, Colombia, Mexico, and Peru.

The level of international reserves appears to be adequate in Latin America. Using either the IMF's adequacy of reserves accumulation (Figure 2.1) or the ratio of international reserves to short-term debt (the so-called "Guidotti-Greenspan rule"), in all cases the level of international reserves for the Latin America 5 (LA5) countries seems appropriate (Figure 2.2). In the case of Peru, however, the stock of reserves seems large by both metrics.[11]

A number of challenges are involved in assessing whether reserves are excessive. To begin with, the probability of a sudden stop may be a function of the level of reserves; for example, investors that would otherwise "rush to the exits" in an adverse shock may decide to keep their positions if they feel the central bank has enough reserves to smooth that shock. This seems to be an empirically relevant channel, as shown by the predictive power of reserves in the early warning literature, as discussed earlier. Alternatively, the presence of reserves may encourage risky liability structures; for example, borrowers taking on short-term external debt because they can count on the central bank to provide foreign exchange liquidity if they were to face tighter global financial conditions (Kim 2008).

More generally, much of the benefit of reserves stems from the option of deploying them in the event of distress (rather than from their actual deployment). In game theoretical terms, their use "off the equilibrium path" can bring many benefits, even

[11] Peru's economy is highly dollarized, which creates additional precautionary motives for holding reserves that are not captured by that metric (such as the need to provide foreign exchange liquidity as a lender of last resort).

if reserves are not deployed. The majority of countries in Latin America have not experienced a major homegrown crisis since the early 2000s. The decline in currency mismatches, and the large stock of reserves accumulated, certainly played a significant role in building that resilience. However, even if the prudential benefits of reserves are very large, they are likely subject to diminishing returns. For example, in a standard buffer–stock savings model, an additional dollar buys less and less in terms of consumption insurance at the margin. Similarly, the prudential benefits of accumulating reserves past an adequacy level are likely to decline at the margin (whereas the moral hazard effects on private sector risk-taking behavior may not).

INTERVENTION TO ATTENUATE FINANCIAL STABILITY RISKS

Advanced economies with floating exchange rate regimes often have a "benign neglect" view of the exchange rate. This is supported by a long history of exchange rate swings, sometimes sizable, without adverse effects for financial stability.

Among emerging market central banks, however, financial stability concerns feature much more prominently. They typically dislike sharp movements in the exchange rate, particularly those that involve a sharp depreciation. Currency mismatches on corporate and financial balance sheets are a major source of financial fragility. They played a central role in currency crises in the region, including high profile cases such as Mexico in 1994, Brazil in 1999, and Argentina in 2001. When currency mismatches are present, sharp movements in the exchange rate can easily render a borrower insolvent—including the government. And if mismatches are present in the financial sector, the shock can easily gain a systemic dimension. These mismatches have declined over time, due to tighter financial supervision and regulation, and a greater awareness of the risks involved among borrowers. But there is a genuine fear that pockets of vulnerability may emerge during times of distress. For example, large firms suffered heavy losses in Brazil and Mexico because they used complex foreign exchange derivative products.

In principle, a depreciation that is not warranted by perceived fundamentals could be self-correcting, to the extent that the overshooting of the exchange rate increases the expected returns in local currency. That should entice investors to keep, or even increase, their local market exposures. However, in practice, it is feared that sharp depreciations can create adverse dynamics in the foreign exchange market, beyond what is warranted by fundamentals. The exchange rate's automatic stabilizer role may thus break down, resulting in disorderly conditions, as discussed in IMF (2015). Several factors can contribute to adverse dynamics in the foreign exchange market, including the fears of unknown currency mismatches (that is, even if mismatches are small, investors may still flee because they believe, or expect that other investors believe, that mismatches are potentially serious).

The case for intervention under those circumstances is fairly uncontroversial, unless the extent of intervention is perceived to be excessive; that is, if the central

bank is perceived to be resisting the movement to a new equilibrium.[12] We should bear in mind that it is very difficult to assess the equilibrium exchange rate in real time, and whether movements, even if sharp, should be considered "excessive." In the limiting case, excessive intervention could become unproductive if it facilitates capital flight that would not otherwise take place under a more depreciated exchange rate. In general, there can still be a case for some intervention to help smooth the impact of a permanent shock if that helps prevent financial stability risks from materializing. However, the central bank should remain mindful of the moral hazard that this can create (such as encouraging excessive risk-taking behavior by the private sector because of an implicit "put").

Conversely, central banks may also intervene to slow the pace of appreciation if they fear that it is moving the exchange rate away from fundamentals and setting the stage for an eventual correction that could be disruptive. This type of intervention is discussed in more detail later in the chapter.

INFLATION PASS-THROUGH

Another motive for intervening is the concern of pass-through to inflation. Exchange rate pass-through has declined over time, as central banks in the region have established their credibility—and despite marked increases in import ratios (see Carriere-Swallow and others 2016). However, the sheer size of a sharp depreciation can still have nonnegligible effects on inflation, even under a small rate of pass-through. Moreover, there may be concerns that the effects may be nonlinear, and become stronger after a large depreciation, with some threshold level of depreciation after which the pass-through increases.

Also, the exchange rate remains an important focal point people use to assess the strength of the economy. A large depreciation may adversely affect confidence and price- or wage-setting behavior, even in the nontradable sector. If the shock to the exchange rate is permanent or highly persistent, the economy will need to cope with and adjust to it. If a large swing in the exchange rate is perceived to be temporary, then there could be a case for using foreign exchange intervention to counter that overshooting and to limit its impact on inflation, inflation expectations, and relative prices more generally—which could in fact affect resource allocation.

This motive for intervention is less controversial, to the extent that it is consistent with the monetary policy objective (meeting the inflation target) and is driven by the response to a perceived temporary shock to foreign exchange markets. The case for using intervention is stronger if it has a more immediate effect on the exchange rate and avoids the need to adjust the policy rate in response to

[12] There have been large episodes of reserve deployment in the region, including Brazil's foreign exchange swap program, which at its peak corresponded to about one-third of reserves (about $100 billion). Moreover, the settlement of these operations was in domestic currency. However, episodes of sustained deployment remain rare compared to episodes of sustained accumulation.

exchange rate developments (central banks typically want to adjust the policy rate gradually and predictably, making it a less suitable instrument to respond to high-frequency fluctuations). However, inflation-targeting countries need to credibly highlight that foreign exchange intervention is subordinated to interest rate policy to avoid misperceptions and potential confusion about the central bank's objective (which, if not well articulated, could be a significant cost of intervention).

MANAGING MORE PERSISTENT SHOCKS

Typically, sustained intervention is associated with capital inflows, since the fear of running out of reserves (or seeing them drop below prudential metrics) eventually limits the willingness to sell foreign exchange. However, the question of how to respond to persistent depreciation pressures will likely become more and more pertinent if the global financial cycle reverses, and countries experience sustained capital outflows. This is somewhat uncharted territory, and the discussion is left for Chapter 6.

One of the main concerns in the face of persistent capital inflows is the loss of external competitiveness and Dutch disease considerations. These concerns tend to be labeled as mercantilist. It should be acknowledged, however, that it can be quite costly for an economy to adjust rapidly to the new equilibrium exchange rate, and for workers to move from the tradable to the nontradable sector and back, following a persistent appreciation that eventually reverses. Tradable firms may be credit constrained, go out of business, and only slowly be replaced by new entrants once the cycle reverses. The presence of currency mismatches in nontradable sector firms will only compound such a problem.

Sustained capital flows can also exacerbate prudential concerns. While the risks of capital flows are typically associated with "hot money" flows that can quickly reverse, persistent inflows can fuel credit and asset price booms, which often result in crises. These are of concern for countries with shallow financial markets. Persistent flows may be even riskier, since the longer the climb, the larger the potential fall. Risks can be amplified if the domestic financial system does not allocate the easy money toward productive uses, and instead uses it to finance consumption booms or asset price bubbles.

Despite these legitimate concerns, it is not clear whether intervention is an adequate tool to manage persistent shocks, for several reasons. First, it becomes harder to make the case that intervention is used to prevent an overshooting of the exchange rate, as opposed to resisting the movement to a new equilibrium. There are also concerns that intervention may become less effective over time. By smoothing the shock to the exchange rate, the central bank may encourage more inflows during the boom phase (as investors expect the exchange rate to continue to appreciate, which increases their expected gains). The opposite is also true, and intervention may stimulate outflows when the capital flow cycle turns (as investors want to take advantage of the delayed adjustment to flee at a more favorable

exchange rate). To the extent that intervention is perceived to be costly, it may become a less suitable tool for dealing with permanent shocks, even in models where it continues to have traction (Ghosh, Ostry, and Chamon 2016). In these circumstances, there is a stronger case for adjusting the macro policy stance in response to the shock. Intervention may play a supporting role, at best. A full-fledged discussion of how to manage capital flows is beyond the scope of this chapter, which focuses only on intervention. For that discussion, please refer to IMF (2012).

CONCLUSION

This chapter discusses motives for foreign exchange intervention under a flexible exchange rate regime.[13] It emphasizes that even if intervention seems desirable, its cost must also be considered, and the exact nature of those costs remains a subject of debate.

Many point to the interest rate differential as a measure of the cost of holding reserves. Yet that does not give a complete picture, as it fails to consider the change in the exchange rate, which can make intervention even more costly due to the forward premium puzzle (in which the higher interest domestic currency would tend to appreciate). Likewise, to the extent that the central bank leans against the wind, and intervenes when the exchange rate overshoots, the resulting valuation effect may reduce the costs. Furthermore, the interest rate differential fails to factor in differences in credit risk. Perhaps more important, it abstracts from the fact that international reserves can reduce risk premiums, not only for sovereign borrowers, but also for corporate and financial borrowers.[14]

Although settling this debate is beyond the scope of this book, it seems reasonable to assume that these costs are not minimal. Authorities would therefore typically need to make a compelling case for the benefits of intervention.

The policy framework and the policy mix can also influence the adoption of alternative countercyclical policies, including foreign exchange intervention. For example, an economy that is well integrated with global financial markets and is experiencing overheating may fear that raising interest rates to cool domestic demand could stimulate larger capital inflows. These inflows can fuel domestic credit expansions and stimulate demand. They can also contribute to asset price inflation—or even unsustainable asset price bubbles—and inflationary pressures. This would result in appreciation pressures, which could drive the policymaker to consider foreign exchange intervention, along with macroprudential policies—or even capital controls as a more frequent instrument among the usual elements in the policymaker's toolkit. Chapter 6 revisits these issues.

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[13] The actual effectiveness of intervention is left for Chapter 5, whereas Chapter 4 presents existing evidence.

[14] For a detailed discussion of alternative metrics of this cost, please refer to IMF (2015).

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CHAPTER 3

A Taxonomy of Intervention

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This chapter presents different frameworks for implementing foreign exchange interventions, including whether they are transparently communicated to the market or kept secret, and whether they are rules-based or discretionary. The chapter also delves into the motives for the various types of foreign exchange intervention, including whether interventions take place in the spot market or in the derivatives market—and the rationales for each type. The chapter also summarizes recent interventions in some Latin American countries.

OBJECTIVES AND TRANSPARENCY

The issue of transparency in foreign exchange intervention has been the subject of much debate among policymakers and economists. A review of the literature shows that secret intervention by central banks has been supported by several authors. For instance, Vitale (1999) argued that secret sterilized intervention can be used to influence agents' expectations and exchange rates, given the access to private information on these fundamentals. Sarno and Taylor (2001) found evidence of the effectiveness of secret official intervention, through either the portfolio channel or the signaling channel. They also argued that coordination among central bankers, and some degree of transparency may enhance the foreign exchange intervention. The empirical work undertaken by Dominguez and Frankel (1993), with the use of data on intervention and exchange rate expectations, was instrumental to overcome two major handicaps characterizing the empirical studies of the 1980s, which largely rejected the effectiveness of intervention. Based on the comprehensive IMF's 2001 Survey of Foreign Exchange Market Organization, Canales-Kriljenko (2003) found that on some occasions the central bank would benefit from keeping its foreign exchange intervention secret. In these cases, the informational advantage to the central bank may protect it to some degree from speculative attacks and falling into speculative trading games from large traders in the market. On the other hand, in the context of a meeting of deputy governors of central banks from major emerging market economies to discuss foreign exchange intervention, Archer (2005) found that many policymakers are more in favor of transparency regarding the intervention ex ante, and transparency about actual intervention operations ex post. However, secret

The opinions expressed in this chapter are the sole responsibility of the authors.

interventions were still supported by some, under the rationale that the market has no target to attack, or to avoid the perception that the central bank has failed. More recently, central banks with full-fledged inflation-targeting frameworks and with strong credibility rely more on transparency ex ante and ex post regarding the frequency and amount of intervention.

Yet, even when transparency is chosen, several issues surround its degree and type. It is important to distinguish between policy transparency and operational transparency. In the first case, central banks can decide to disclose the rules of foreign exchange intervention on a general level (such as smoothing out excess volatility), or on a specific level (such as the triggers for intervention and how they work). Regardless of the level of transparency, some central banks prefer not to disclose trading tactics, because, in some cases, those tactics can give some market participants an undue advantage to bet against the central bank and undermine the objectives of the foreign exchange intervention.[1]

It can be argued that "tactical ambiguity" about the exact timing and amount of intervention will heighten prospects for achieving the intervention objective efficiently, that is, with the least amount of intervention. Transparency can be in "real time," when the central bank explains its actions as they happen, ex ante (before they happen), or ex post (after they happen) (Enoch 1998).

A central bank's credibility is also relevant when deciding the level of transparency. On the one hand, some experts suggest that if a central bank is credible, and market participants understand its underlying rationale for intervention, transparency could be reduced. On the other hand, a central bank with strong credibility may want to reveal its actions so that the market can benefit from the central bank's signaling effect.

Transparency policy (or the degree of its transparency) may also vary with the specific objectives of intervention, the tools available to the central bank, the number of players in the foreign exchange market, and the depth and liquidity of money and capital markets in the country. In some cases, market participants may speculate against a central bank in which operations are bound by excessively strict rules. Ex post transparency could also be effective if the central bank's signaling, after the intervention, influences market expectations by transmitting information on the fundamentals or on future policy actions.

Transparency is also related to the motives of intervention (see Chapter 2). As argued in previous chapters, spot interventions help address liquidity imbalances in the foreign exchange market: buying if there is excessive foreign exchange in the market (such as owing to capital inflows) or selling if there are sudden capital

[1] Bank for International Settlements Working Paper 144/2003: "Transparency versus Constructive Ambiguity in Foreign Exchange Interventions" refers to the IMF Code of Good Practices' case for enhancing central banks' intervention transparency. However, it also highlights that the code states that " . . . there are circumstances where full transparency may not be beneficial to achieve policy goals, . . . the Code recognizes that there may be justifications for limiting certain disclosure practices in situations where increased transparency could endanger the effectiveness of policies, or be potentially harmful to market stability."

outflows or seasonal liquidity shortages of foreign exchange. Against a foreign exchange hedging demand, swap interventions could be more useful for easing the hedging needs of participants and avoiding excessive and unnecessary pressure on the spot market. This point is subsequently elaborated.

The transparency of intervention practices varies across countries. For example, Group of Three (G3) countries began enhancing intervention transparency in the mid-1990s. The Federal Reserve started to report its intervention activity on its webpage quarterly, and it released daily intervention figures with a one-year lag. Hung (1997) estimates that about 40 percent of the Federal Reserve's foreign exchange interventions during 1985–89 were not announced. The Bank of Japan did not announce its interventions either, but it reported the amounts of exchange rates ex post. The European Central Bank (ECB) announced some of its interventions, although the information contained in the announcements was limited and did not include amounts and timing (Canales-Kriljenko, Karacadag, and Guimarães 2003). In emerging markets, according to a survey on intervention practices in 90 countries, about half of the central banks in these economies announce their presence in the market, while the evidence on how much central bank practices are secret is mixed (Canales-Kriljenko 2003).

In Latin America, some countries have had episodes of secret ex ante foreign exchange interventions in the past, although in most cases, the intervention was made public ex post and its rationale explained. Recently, a move to more transparency and more to rules than discretion, has been observed, in tandem with central banks' shift from monetary aggregate anchors to full-fledged inflation-targeting frameworks. Also, the degree of intervention has been reduced or eliminated altogether in some countries. Yet, during the global financial crisis of 2008–09, some monetary authorities reinstated foreign exchange intervention as a temporary recourse, either to rebuild the level of international reserves, as in Chile in 2011, or to smooth out volatility, like Colombia did in 2012. Some countries, such as Peru, have continued to use discretion over rules (see Chapter 12).

Debate is ongoing about the costs and benefits of either strategy, but empirical observation, as illustrated in the country chapters, makes it clear that there is no one rule that fits all. Yet, a case can be made that transparency may be the best approach to foreign exchange intervention, as Chapter 6 discusses.

A few central banks disclose or publish data pertaining to foreign exchange interventions. Some provide initial guidance close to intervention time, while others publish the data with a lag. Rare interveners, such as the Bank of Canada or the Bank of England, disclose volumes close to the intervention time; others prefer to publish intervention volumes with a lag spanning one to six months. For example, Japan discloses daily volumes with a six-month lag, while Australia discloses monthly volumes with a one-month lag. Brazil used to publish intervention data with a one-week lag but now prefers to release market operations data through monthly press releases on its website. The Hong Kong Special Administrative Region and Paraguay publish foreign exchange intervention volumes the same day. In general, most central banks in Asia and Africa do not publicly disclose intervention data. Table 3.1, from the IMF's Annual Report on

Exchange Arrangements and Exchange Restrictions, reveals several central banks' disclosure practices.

It is important to note that a central bank's credibility in its commitment to the inflation target is crucial for all inflation-targeting countries. Clear rules of engagement for foreign exchange intervention, and clear messages that the main objective is the inflation target, and not a specific exchange rate level, are instrumental for building and maintaining a central bank's reputation.

RULES VERSUS DISCRETION

Regardless of how transparent it is, foreign exchange intervention can be rules-based or discretionary. In some cases, monetary authorities clearly establish the conditions for an intervention to take place. Some rules are specific and state the amount or the nature of the purchases or sales of foreign currency. Some even clarify the objectives for such interventions. Those objectives could include mitigating exchange rate volatility to rein in financial stability, alleviating hedging needs for exporters, or supplying cash for those needing to fulfill external debt obligations or for imports. It can also be related to competitiveness in a growth-led strategy. In other cases, the central bank follows no rules. When perceptions of problems in the foreign exchange market arise—including financial stability, exchange rate level, liquidity issues, or others—the central bank decides to arbitrarily intervene. That decision is an example of discretionary foreign exchange intervention. Discretionary interventions are not only ad hoc about what triggers the operation but also about the amount of sales and purchases, and the modalities of the sales and purchases. By definition, discretionary foreign exchange interventions are much less predictable than rules-based interventions.

Beyond preestablished policy response functions based on specific rules, central banks can announce programs of purchases or sales of foreign currency. For example, central banks can aim for certain levels of international reserves as a share of GDP, of imports, or of short-term debt obligations. Typically, the goal is to be on par with countries of similar characteristics. The goal could also be to preempt exchange rate levels perceived as persistently deviating from fundamental values as a way to minimize resource misallocations that could be detrimental to economic activity.

Regardless of the ultimate objective, central banks preannounce programs for purchasing or selling foreign exchange for a preestablished period. Typically, the program also specifies regularly timed auctions of foreign exchange as well as the volume in each auction (often at a constant rate). This mechanism allows the central bank to predictably convey the message to the market of an intervention to limit any disruption. It may also implicitly point to the expected path of monetary policy that is consistent with the foreign exchange intervention in some cases (Mussa 1981)—thus also revealing the central bank's projections to the market and, thereby, its price stability. In Latin America recently, Chile aimed to build reserves and mitigate the effect of a persistent appreciation in 2011, and

TABLE 3.1.

Current Disclosure Practice: AREAER Survey Results 2016

Economy or Region	Immediate Disclosure and Other Disclosure Channels and Time Lags
Armenia	The Central Bank of Armenia publishes intervention data on its website weekly on Mondays.
Australia	Monthly purchases and sales of foreign exchange are published on the Reserve Bank of Australia website with a one-month lag. Daily data on foreign exchange market interventions are published on the website annually, with the release of the central bank's annual report.
Azerbaijan	The Central Bank of Azerbaijan publishes foreign exchange intervention data quarterly.
Bolivia	The Central Bank of Bolivia publishes exchange market intervention and foreign exchange purchases and sales data in "Weekly Statistics" on its website.
Brazil	The Central Bank of Brazil publishes intervention data monthly on its website on currency flows and open market operations.
Canada	Interventions are announced on the Bank of Canada's website, and the amount of intervention is published in the government's monthly official press release on international reserves.
Chile	The Central Bank of Chile usually announces the amount of foreign exchange it intends to buy or sell in its monthly bulletin. It publishes auction results daily and reserves weekly.
Colombia	The central bank of Colombia, the Banco de la República, publishes daily and monthly intervention results in the foreign exchange market and information regarding each auction on its website.
European Union	The European Central Bank publishes information on interventions. When it intervenes, the ECB intervenes at the market prices' quotes.
Guatemala	The Bank of Guatemala, effective November 2012, publishes the foreign exchange intervention data on its website.
Hong Kong SAR	The Hong Kong Monetary Authority makes immediate announcements of the impact on the aggregate balance from purchases or sales of US dollars through various information outlets, including Reuters and Bloomberg Finance L.P., and on its website.
Iceland	The Central Bank of Iceland publishes monthly data on foreign exchange interventions in the foreign exchange market.
India	The Reserve Bank of India publishes monthly data on its interventions (foreign exchange purchases and sales) in its monthly bulletin, with a six-week lag.
Indonesia	Bank Indonesia does not disclose data on its interventions.
Jamaica	The Bank of Jamaica publishes information on its interventions in its Annual Report and Quarterly Monetary Policy Report.
Japan	Interventions in Japan fall within the mandate of the ministry of finance, which publishes daily purchases and sales amounts as well as intervention currencies on its website with a lag.
Korea	Korean interventions in the spot market or through derivatives in the forward market are not announced, and intervention data are not published; there are no regular channels. Figures on foreign exchange reserves are published twice a month, but their movements are affected by several factors, in addition to foreign exchange interventions.

(continued)

TABLE 3.1. ***(continued)***

Current Disclosure Practice: AREAER Survey Results 2016	
Economy or Region	**Immediate Disclosure and Other Disclosure Channels and Time Lags**
Mexico	The Bank of Mexico publishes results of all foreign exchange interventions on its website, including the new foreign exchange hedging program of nondeliverable forwards announced by the Foreign Exchange Commission on February 21, 2017. All results of past rules-based and regular auctions are also publicly available.
Peru	The Central Reserve Bank of Peru publishes daily information about its intervention operations on its website.
Russian Federation	The Bank of Russia publishes information about the frequency and volume of foreign currency interventions on its website under the "Liquidity of the banking sector and monetary policy instruments" subsection of the "Statistics" section.
Singapore	The Monetary Authority of Singapore intervenes through agents and does not publish information on its interventions.
Sweden	Sveriges Riksbank announces each intervention in a press communiqué, explains the motive, and discloses the framework of intervention and amount data.
Turkey	The Central Bank of the Republic of Turkey publishes results of auctions and the volume of its direct interventions on its website with a lag.
Uganda	The Bank of Uganda publishes information on interventions in its monthly, quarterly, and annual reports, including breakdowns for reserve buildup, interventions, and targeted transactions.
United Kingdom	The Bank of England has a separate pool of foreign exchange reserves, which it uses at its discretion to intervene in support of its monetary policy objectives. A monthly press release issued by Her Majesty's Treasury reports the treasury and central bank interventions.
United States	The Federal Reserve Bank of New York acts as the operating arm of the Federal Reserve System. Interventions are announced when they occur, and the size of the interventions is reported in the Federal Reserve Foreign Exchange Operations quarterly bulletin.

Source: IMF AREAER 2016.

Mexico implemented a program for purchasing foreign exchange in 2017 to counterbalance the instability arising out of the North American Free Trade Agreement renegotiations.

In theory, the discussion between rules and discretion for monetary policy is well established. Going back as early as Kydland and Prescott (1977) and Barro and Gordon (1983), monetary policy debates have focused on problems of time inconsistency. In that literature, when discretionarily choosing monetary policy to achieve an inflation target jointly with an output gap target, the welfare-optimizing equilibrium results in an inflation bias, owing to a conflict of interest (Drazen 2003). In Calvo (1978), the central bank faces the problem that the optimal inflation target today may not be the optimal target come next period for maximizing some fiscal objective. Agents internalize this. Yet, the outcome is not first best. The central bank can then have rules that solve the maximization problem and thus avoid the cost of discretionary policy. However, rules also involve economic costs. The trade-offs related to each of the mentioned costs result in the optimality of rules or discretion. Rogoff (1985) extends this literature, showing

that having a more hawkish central banker reduces the costs associated with the time-inconsistency problem.

For foreign exchange intervention, the same logic need not necessarily apply. Rather, rules give the authorities predictability instead of tying the central bank's hands. Presumably, such predictability would reduce financial instability. For example, Montoro and Ortiz (2016) show that in a general equilibrium model, the amount of foreign exchange intervention needed to stabilize the exchange rate under rules is much smaller than under discretion. However, rules also limit the ability to respond differently when needed; in some circumstances, discretion to intervene in foreign exchange markets could be more effective precisely because of its lack of predictability. Not surprisingly, then, it is observed that in Latin America and in many other regions, central banks sometimes prefer rules-based foreign exchange intervention, but many other times they choose to stick to discretionary policies for foreign exchange intervention.

Moreover, for inflation-targeting countries, foreign exchange intervention needs to be clearly subordinated to the inflation target, the main objective of the central bank. Otherwise, it could trigger another variety of the time-consistency problem raised earlier; for example, if the central bank is perceived to pursue an exchange rate objective rather than an inflation target objective. For inflation-targeting central banks, then, it is key that the market understands that regardless of whether foreign exchange intervention aims at mitigating the exchange rate pass-through to domestic prices of rapid and large changes in the exchange rate or at reducing the effects of financial stability resulting from excessive exchange rate volatility, the ultimate goal of intervention is to keep inflation in check. The connection between foreign exchange intervention and the inflation target need not be direct, however. An indirect channel would be financial stability concerns resulting from currency mismatches that could lead to higher inflation if they triggered financial instability. In any case, foreign exchange intervention should always be subordinated to achieving the inflation target.

The central bank can announce the general rules of intervention without specifically indicating limits on the amounts and frequency of interventions (see the earlier discussion on transparency of intervention). Rules of intervention could be very specific; yet they must be designed to preclude the main players in the foreign exchange market from taking unfair advantage of their position in the market. In general, inflation-targeting central banks would be better served by announcing the rules of engagement for foreign exchange intervention. These rules could be specific or more qualitative, such as leaning against the wind or reducing excess exchange rate volatility to limit the negative effects of large exchange rate fluctuations not supported by changes in the fundamentals.

Connected to these rules, and the transparency of interventions raised in the first section, are interventions related to paragovernmental institutions. For example, in Mexico, the cash flows of the state-run oil company PEMEX demand and supply substantial amounts of US dollars each year because of the company's crude oil exports and gasoline and other petroleum-related imports. Low-capacity utilization resulted in a negative balance contribution to international reserve

accumulation in the first half of 2017. By law, PEMEX must sell to the central bank all foreign exchange that results from exporting crude oil. However, when the proceeds from crude exports are not enough, or when foreign debt payments are due, PEMEX buys US dollars from the central bank. Given the size of PEMEX—which until 2017 had been the largest contributor to international reserve accumulation—its purchases and sales of foreign currency need to be properly coordinated with the central bank. In the past, especially before the 1990s, it was common for Latin American state-owned firms to borrow abroad. Lack of coordinated sales and purchases of these government agencies worked in practice as very volatile and unpredictable foreign exchange interventions and increased financial instability. In Chile, the state-owned copper company Codelco distributes part of its sales to the government. Whether that foreign exchange ends up in the government's account in the central bank or a commercial bank (in particular, the state-owned bank *Banco Estado*), is not clear. Notwithstanding that, Codelco also purchases and sells foreign exchange in the market—including foreign exchange hedging—thus affecting market exchange rates.

The frequency of exchange rate interventions depends partly on the nature of the interventions. Preannounced programs are the most predictable, not only in volume, but also in frequency. Rules-based intervention can be anticipated by the market. Although frequency cannot be perfectly estimated, market conditions on the back of a transparent rule enable the anticipation of when thresholds could trigger an intervention. Anticipating discretionary intervention is, by definition, more difficult. Thus, its frequency is less homogenous over time.

In Latin America, foreign exchange intervention has been varied. Different countries have resorted to rules and discretion. Moreover, several countries have switched from rules to discretion and back over time. For example, as mentioned earlier, Chile intervened in 2011 with a preannounced program to purchase international reserves to match similar countries' reserves-to-GDP ratios (see Chapter 8). Colombia and Mexico have, at times, used rules that specified that when the daily volatility of the exchange rate over a specific number of days' moving average exceeded a preestablished threshold (20 days), intervention was triggered. Colombia discontinued this rule in May 2016 (Chapter 9). Mexico stopped that program in February 2016 (Chapter 11).

At other times, intervention in Colombia and Mexico has been more ad hoc, that is, discretionary. Brazil also implemented rules-based interventions for some time in response to the so-called 2013 taper tantrum (Chapter 7). This involved daily auctions of $3 billion per week from August 2013 focused on preannounced swap and repo operations. The program was originally scheduled to stop at the end of 2013, but it was extended several times, before ending in March 2015. More recently, Mexico introduced a program of up to $20 billion of nondeliverable forwards (NDFs) settled in pesos in late February 2017; and $1 billion short-dollar contracts were auctioned in March 2017. In October of the same year, this program increased to $5 billion. The additional $4 billion was allocated as follows: $1 billion the day after the announcement (October 25, 2017), with maturities of one month ($400 million), two months ($300 million), and three

TABLE 3.2.

Importance of Various Motives for Intervention, 2005–06 and 2011–12

	Importance in 2005–06			Importance in 2011–12		
Motive	**High**	**Moderate**	**Low**	**High**	**Moderate**	**Low**
To curb excessive exchange market speculation	8	4	0	11	4	0
To maintain monetary stability	7	2	2	10	2	2
To discourage sharp capital inflows or outflows	4	3	1	5	5	1
To build or reduce foreign exchange reserves	7	0	2	6	2	2
To smooth the impact of commodity price fluctuations	3	1	3	4	1	3
To maintain or enhance competitiveness	2	2	3	4	1	3
To alleviate foreign exchange funding shortages of banks and corporations	4	2	0	5	2	0

Source: Bank for International Settlements Questionnaire, February 2013.
Note: The data show the number of central banks, out of 19 that were surveyed, that responded to the importance of various motives, rating on a scale of 1 (most important) to 7 (least important); "high" indicates a response of 1 or 2; "moderate" indicates a response of 3 through 5, and "low" indicates a response of 6 or 7.

months ($300 million), followed by weekly auctions of $500 million every Wednesday until early December 2017.

IN WHICH MARKET—SPOT OR DERIVATIVES?

As Chapter 2 notes, foreign exchange intervention typically has several objectives, which may include price stability, financial stability, buffer building, and in a few instances, market development. To achieve these objectives, authorities consider foreign exchange intervention complementary to interest rate policy to contain inflationary pressures from exchange rate pass-through and preserve financial stability by mitigating risks from currency mismatches. It therefore supports economic growth in episodes of financial instability, at least indirectly. Accumulating international reserves to build stronger buffers that can respond to external shocks is typically also referred to as a motive for intervention.

Several factors drive a central bank's decision to intervene to achieve its intended objectives. These then lead to the modalities and instruments used to achieve the desired results. Inflation-targeting central banks in Latin America predominantly use foreign exchange intervention to smooth out excessive exchange rate volatility and to create strong external buffers against unexpected shocks by accumulating a high level of international reserves. Regardless of the motives within the region, a key question is which market and instruments are most effective in attaining the objectives. Table 3.2 lists some key motives.

TABLE 3.3.

Widely Used Foreign Exchange Intervention Instruments

Instrument	Mechanism of Central Bank
Foreign exchange spot transactions	Buys and sells foreign exchange spot
Foreign exchange forwards	Buys and sells foreign exchange at an agreed rate and date in the future
Foreign exchange swaps or repos	Buys and sells foreign exchange spot and purchases foreign exchange forwards on a predetermined date
Forwards, nondeliverable forwards, futures	Pays domestic currency equivalent of change in foreign exchange value on a predetermined date
Foreign exchange options	Sells option to buy foreign exchange if the currency exceeds threshold

Source: IMF staff.

TABLE 3.4.

Foreign Exchange Instruments of the Latin American Central Banks

	Modality of Foreign Exchange Instruments				
Instrument	Bilateral	Auction	Window[2]	Tenors	Other Characteristics
Foreign exchange spot	✓	✓		Today/tomorrow / spot	Discretion/rules-based
Foreign exchange forwards/ nondeliverable forwards	✓	✓	✓	Standard tenors	Discretion/rules-based Exchange traded
Foreign exchange swaps[1]	✓	✓	✓	Standard tenors	Bilateral/discretionary Auctions/rules-based Window/rules-based
Foreign exchange repos		✓		Standard tenors	Irregular/discretionary
Foreign exchange options		✓	✓	Mostly in one month	Discretion/rules-based
Others			✓		Discretion/rules-based

Source: IMF staff.
[1]Usage includes for hedging with underlying exposure.
[2]Window operations include exchange-traded instruments.

This section aims to present a taxonomy of intervention practices in Latin America. Specifically, it highlights practices typically used by countries in the region that are conditional on the type of shock they are trying to mitigate.

Sterilized intervention in spot markets is one instrument at central banks' disposal. It remains the market choice, but by no means the only one. Latin American central banks use a diverse range of instruments to intervene in the foreign exchange market. These include forwards, swaps, repos, NDFs and options, as well as US dollar–linked debt. Most central banks in the region have used both spot and derivatives markets extensively. Table 3.3 presents some of these instruments, as well as the mechanism through which each operates.

The rationales that central banks give for experimenting with a wide variety of instruments besides the spot market include the structure and growing

TABLE 3.5.

Foreign Exchange Intervention Framework and Instrumens, by Country

	Foreign Exchange Intervention Framework		Main Instruments of Foreign Exchange Intervention				
Country	Rules	Discretion	Spot	Swaps	Nondeliverable Forwards[1]	Options	Others[2]
Brazil	✓	✓	✓	✓	✓		✓
Chile	✓	✓	✓				✓
Colombia	✓	✓	✓			✓	
Costa Rica		✓	✓				
Mexico	✓	✓	✓		✓	✓	
Paraguay	✓	✓	✓		✓		
Peru		✓	✓	✓			✓
Uruguay		✓	✓				

Sources: Central banks; and IMF staff.
[1]Nondeliverable forwards are settled in local currency; they are also referred to as currency swaps.
[2]"Others" includes instruments such as repo and certificates of deposit linked to the exchange rate.

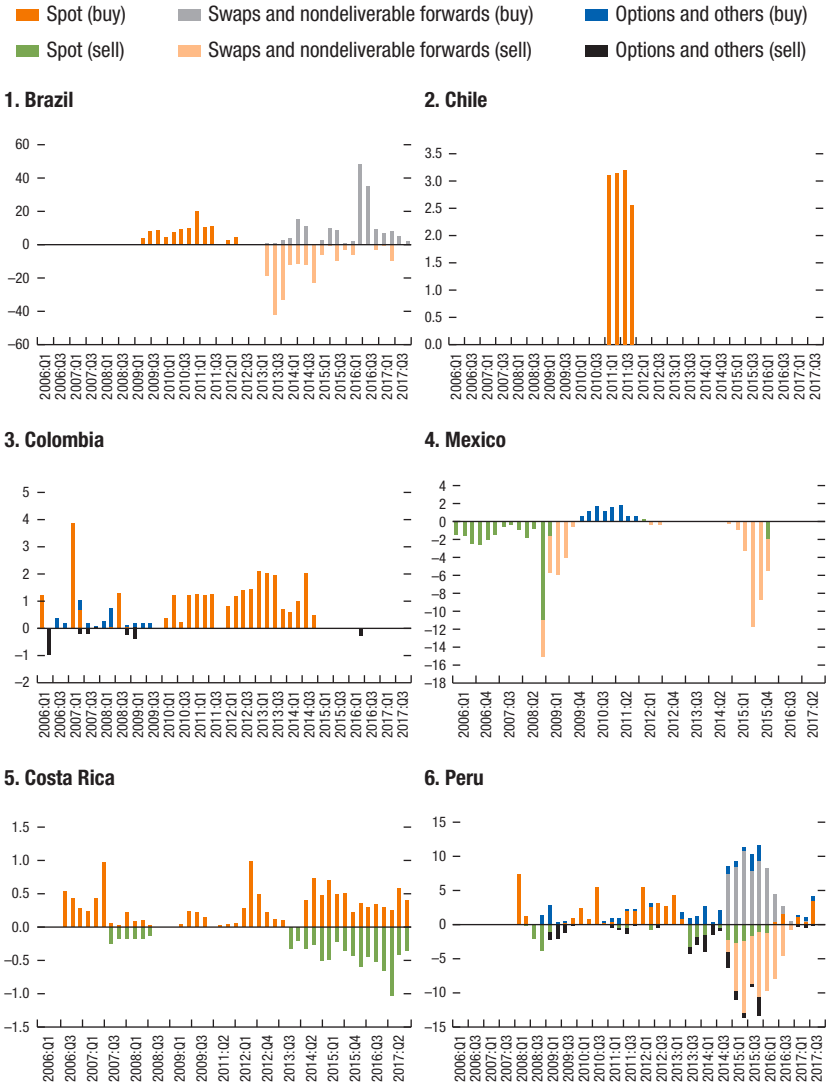
sophistication of the markets and the multiple objectives central banks are trying to achieve. In addition to the level of international reserves, central bank foreign exchange interventions in the spot market affect interest rates in monetary and capital markets. Hence, a few of the region's central banks have introduced instruments to intervene in the foreign exchange market that would reduce not only the pressure on the spot foreign exchange rate but also lessen the distortions of foreign exchange forward market transactions on interest rates in money and fixed income markets, and at the same time, prevent higher hedging costs. Table 3.4 summarizes the various instruments used in Latin America. These practices are then elaborated, and their utilization and frequency are explained.

As noted, some countries use a rules-based foreign exchange intervention framework and others use a discretionary-based one. In some instances, countries have even switched from one to the other. The choice of instruments in Table 3.4 in most instances is dictated by the objective and depth of the market, while the choice of foreign exchange intervention framework is mostly influenced by the frequency of interventions.

Regardless of the choice of framework or instrument, most foreign exchange interventions in Latin America have focused on financial stability or on building buffers. In some episodes of large depreciation pressures, price stability has been the objective. Table 3.5 shows the variety of frameworks and instruments Latin American central banks use.

Brief descriptions of country practices follow, with further details in Chapters 7 through 13. See Figure 3.1 for the interventions by instrument and exchange rate.

Figure 3.1. Foreign Exchange Intervention in Latin American Countries, by Instrument and Exchange Rate, 2006–17
(Billions of US dollars, left scale)



Sources: Central banks; and IMF staff.
Note: Data are by quarter for each year.

COUNTRY PRACTICES IN FOREIGN EXCHANGE INTERVENTION

Brazil

The Central Bank of Brazil has intervened in foreign exchange markets since the adoption of the floating exchange regime in 1999. Sterilized intervention in spot markets is one instrument at the central bank's disposal, but by no means the only one. The central bank uses a variety of instruments to intervene in the foreign exchange markets, including outright US dollar sales and foreign exchange repos and swaps. In addition, up to 2002, the central bank was able to use US dollar–linked debt instruments (either issued by the national treasury or by the Central Bank of Brazil) in support of the currency, which directly affected the country's gross debt.

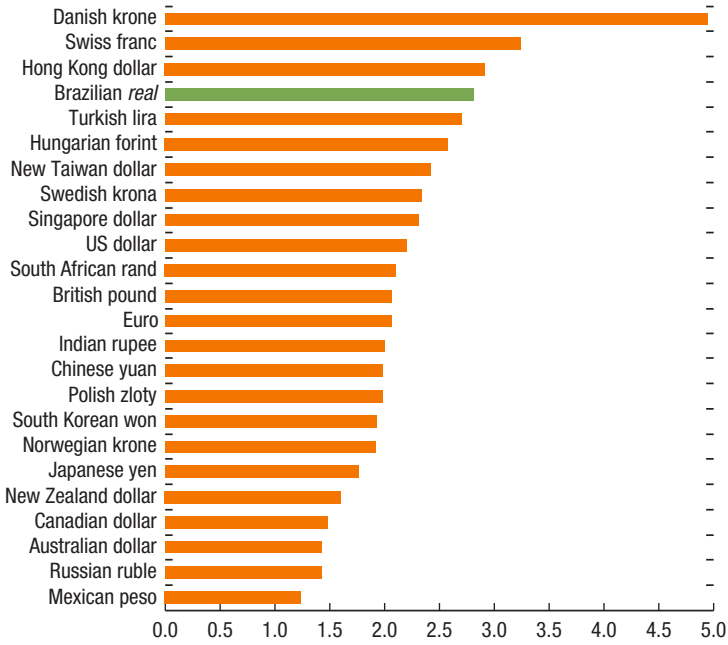
In 2001–02, pressures on the Brazilian *real* intensified amid three major shocks—spillover from the Argentine debt crisis, the 9/11 market jitters in the United States, and public debt solvency concerns following the Brazilian presidential election. The *real* depreciated by up to 44 percent in 2001, and 71 percent in 2002, as international reserves fell to less than $40 billion. The central bank responded by using US dollar–linked debt instruments. However, the Fiscal Responsibility Law, passed in 2002, prohibited the central bank from issuing its own securities beginning in May 2002. Hence, starting in March 2002, the central bank replaced US dollar–linked instruments with so called "Brazilian FX swaps."

In Brazil, spot market transactions are no longer the dominant intervention instrument, mainly because its derivatives markets are among the largest in the world. Trading volumes in derivatives are four times larger than that of the spot market; derivatives markets also lead spot markets into price discovery (see Figure 3.2). The large variety of interventions in Brazil reflects the different central bank objectives, which in turn depend on the period under analysis. During several episodes of market turbulence, the central bank had to counter depreciation pressures and sharp movements of the exchange rate (such as after the election of Lula da Silva in the 2002 election, the 2008 global financial crisis, or the US taper tantrum), while in other circumstances, it seemed to have been weighing against an appreciation of the currency. During 2008–09, the Central Bank of Brazil intervened through a range of tools simultaneously, including spot dollar sales, auctions of foreign exchange swaps and repos, and even indirect US dollar loans to Brazilian firms. Although the central bank has also used repos to provide temporary liquidity to the market, this type of intervention has been limited.

Until recently, the predominantly used instrument has been Brazilian foreign exchange swaps, technically a nondeliverable forward, which factors in the exchange rate risk but is settled in local currency.[2] The instrument requires a high degree of

[2] In Brazil, it is illegal to denominate contracts in foreign currency. Thus, contracts need to be settled in domestic currency even if indexed to US dollars.

Figure 3.2. Ratio of Daily Turnover in Derivatives Market to Spot Market
(Net-net basis, as of April 2013)



Sources: Bank for International Settlements Triennial Survey 2016; and IMF staff calculations.

substitutability—that is, a well-developed derivatives market. From the investor's perspective, the swap is a good substitute for spot US dollars, to the extent that the *real* is fully convertible to US dollars at the date of settlement, thus meeting the demand for hedging. The instrument is structured such that, at maturity, the Central Bank of Brazil pays the international interest rate, i_t^*, plus the actual rate of depreciation, Δe_{t+1}, while it receives the overnight domestic interest rate i_t.

Brazilian foreign exchange swaps provide hedging for investors with open positions, thus directly bidding down the forward exchange rate. At settlement, the Central Bank of Brazil pays its counterparty the additional amount of *reais* necessary to keep the dollar value of the initial open position unchanged. The central bank announces the details of each foreign exchange swap auction one business day before receiving market participants' bids through the *Sistema Especial de Liquidação e Custo* system (known as SELIC). On special occasions, the central bank announces the foreign exchange swap auction for the same day without previous announcement. Until the end of 2015, the notional balance of outstanding foreign exchange swaps amounted to close to $110 billion.

Chile

Chile does not intervene regularly in the foreign exchange market, and its intervention policy has been modest; in past decades, it has intervened sporadically. During 1998–99, interventions were not preannounced and were discretionary. However, in 2001 and 2002, interventions were conducted after a formal policy announcement, under a rules-based framework. These interventions were transparent, including explicit definitions of periods and amounts involved, while clearly explaining the reasons for the interventions. The first of these types of intervention started in August 2001 when the central bank communicated that spot market interventions could occur for up to a maximum of $2 billion over the following four months. Additional sales of $2 billion of dollar-denominated central bank bills were also announced. During that period, spot market interventions totaled $803 million, less than half the maximum announced.

Foreign exchange interventions were again used in 2008 and 2011, but mostly to accumulate reserves. The Central Bank of Chile conducted weekly announced competitive buy auctions of $50 million during the 2011 accumulation program, but it has not intervened in the foreign exchange market since then. Exchange rate movements in Chile allowed for significant current account adjustment, while diluting exchange rate volatility. The central bank usually announces the amount of foreign exchange it intends to buy or sell.

Colombia

The flexible exchange rate regime plays an important role in helping the Colombian economy adapt to changing global conditions. The freely floating

TABLE 3.6.

Colombian Central Bank's US Dollar Auction Program	
Start date	October 30, 2015, with subsequent adjustments.
Objective	Moderate disorderly increases in the exchange rate, which might contribute to an unanchoring of inflation expectations, as well as provide liquidity to the foreign exchange market.
Modality	Auction of call US dollar options for about $500 million, which is about one-third of the daily turnover. The option's strike price is the average spot exchange rate on the previous day. Options are sold through Dutch auctions.
Rule based	Trigger for the sale (as well as for the exercise) requires the daily exchange rate movement to exceed a threshold, usually a given percentage relative to the 20-day moving average.
Trigger	On October 30, 2015, a trigger of 7 percent (depreciation in the 20-day moving average) was established. As foreign exchange volatility subsided, the threshold was lowered to 5 percent on December 23, 2015, and to 3 percent on February 19, 2016.
Execution	The auction program has not been triggered yet, which is likely because of the relative stability in oil prices and the program's success in reducing foreign exchange uncertainty.

Sources: Central Bank of Colombia; and IMF staff.

framework has been complemented since October 2015 by a rules-based-contingent foreign exchange auction program aimed at mitigating excess volatility. Colombia experienced a sharp and fast real depreciation of its exchange rate, of about 34 percent, during 2015. This triggered the introduction of a rules-based foreign exchange intervention program through a competitive auction mechanism. The program was introduced in October 2015 (Table 3.6). The rules-based foreign exchange auction program, discontinued on May 31, 2016, was an effective mechanism to prevent disorderly depreciations and was only effectively triggered on May 20, 2016.

Guatemala

Guatemala has a long-standing, rules-based intervention policy that aims to stabilize excessive exchange rate volatility, while not affecting its trend. Intervention is triggered when the weighted average exchange rate of the sell (buy) transactions is less (more) than the five-day moving average reference exchange rate minus (plus) 0.75 percent. If triggered, the central bank offers up to a maximum of five daily auctions of $8 million each.

Mexico

Mexico has a long history of intervention in foreign exchange markets. The modalities of intervention have evolved. During 1996–2001, interventions were predominantly put options, where the central bank bought US dollars mainly to build up reserves. Thereafter, Mexico moved to rules-based intervention to moderate exchange rate volatility and to build international reserves. Table 3.7 presents a recent intervention program, although not the ongoing one.

TABLE 3.7.

Bank of Mexico's Foreign Exchange Intervention Program	
Start date	November 29, 2011, with subsequent adjustments.
Objective	Moderate disorderly increases in the exchange rate, which might contribute to an un-anchoring of inflation expectations, as well as provide liquidity to the foreign exchange market.
Modality	Rules-based foreign exchange Dutch auction program provided $400 million call dollar options. The option's minimum price equaled the previous day's benchmark exchange rate plus 2 percent. This rule remained in place until April 2013. In December 2014, the mechanism was reintroduced, but with a reduced amount of $200 million and the previous day's depreciation of 1.5 percent.
Rules based	Trigger for the sale requires the daily exchange rate movement to exceed a threshold, usually a given percentage relative to the previous day.
Trigger	Until 2013, a trigger of 2 percent had been established. As foreign exchange volatility subsided, the threshold was lowered to 1.5 percent starting in December 2014, and to 1 percent starting in July 2015.
Execution	Because the minimum price is set at a fairly large threshold for a one-day depreciation, it was triggered only on a few occasions.

Sources: National authorities; and IMF staff estimates.

In February 2017, they announced a new framework for interventions using NDFs settled in pesos for a maximum $20 billion; $1 billion worth of notional principal in short-dollar contracts were auctioned in March, and a new series of auctions were announced in October 2017 to sell NDFs for $4 billion in seven weekly auctions.

Peru

Peru has had a successful inflation-targeting framework since 2002. The constitution gives the Central Reserve Bank of Peru the mandate to preserve monetary stability, a goal achieved during the last 2 ½ decades. The central bank has had an active policy to moderate foreign exchange volatility to limit the negative effects of large exchange rate fluctuations. Interventions are made frequently using spot interventions, NDFs (also referred to as currency swaps), and certificates of deposit indexed to the exchange rate. Spot interventions are invariably performed during a fixed, preannounced, 2-hour window at the end of each trading day.

Peru's foreign exchange market is composed of spot and derivatives, but the latter is shallow and relatively illiquid, even though most traded instruments in the derivatives market are NDFs. As such, commercial banks are used to selling (buying) US dollars in the foreign exchange forward market, hedging their positions by buying (selling) dollars in the spot market, and thus affecting the spot rate. The forward price (spot rate and forward rate differential) may therefore vary considerably according to the demand and supply of US dollars in the forward market; they typically deviate from the covered interest rate parity. These deviations used to produce profitable arbitrage opportunities. However, the central bank introduced a new instrument to reduce pressure on the spot exchange rate, and at the same time, lessen the distortions of the foreign exchange forward market transactions on interest rates in money and fixed income markets, while preventing the rise of hedging costs. So, in September 2014, the central bank added the Central Reserve Bank FX Swaps (SC BCRPs) as an instrument of foreign exchange intervention. SC BCRPs are basically NDFs settled in local currency.

SC BCRPs are derivatives instruments. One party commits to pay a variable interest rate in the local currency, calculated by using an overnight index swap (built by accumulating the daily interbank interest rate). The other party commits to pay a fixed interest rate in foreign currency and the foreign exchange rate variation. At maturity, the settlement is made by netting positions paid in local currency.

SC BCRPs help to control the foreign exchange spot rate, because they allow banks to hedge their positions from their activities in the forward markets without trading US dollars in the foreign exchange spot market. At the same time, they do not affect the money market, because they have no effect on monetary aggregates. As the settlement is on a netting basis, there is no exchange of notional amounts, either at the beginning or at the maturity of the contract. SC BCRPs

are placed under an auction mechanism (the foreign fixed interest rate) that is carried out by the central bank.

Paraguay

The Central Bank of Paraguay intervenes in the foreign exchange market to smooth seasonal fluctuations and speculative movements under the authority of Article 50 of the Organic Law of the Central Bank of Paraguay (489/95), Article 3 of which aims to preserve and safeguard the stability of prices and to promote the efficiency and stability of the financial system. The central bank is constantly involved in the foreign exchange market by either buying or selling US dollars. In recent years, such involvement resulted in a substantial accumulation of international reserves.

The central bank uses two mechanisms to intervene in the foreign exchange market: (1) preannounced sales of the US dollars it receives from the ministry of finance to exchange into guaraníes to support its public expenditures; and (2) discretionary interventions, without previous announcement, to address any abrupt market movements. Under the first mechanism, the central bank announces monthly the frequency and size of the following month's sales. However, the amount is made at the central bank's discretion and should not exceed the current year's US dollar proceeds bought from the ministry of finance.

CONCLUSIONS

This chapter aimed mainly to explore and present a taxonomy of the different dimensions of foreign exchange intervention implementation. Some of the differences could be attributed to country-specific characteristics, others to the goal or strategy of a central bank to achieve its highest efficacy, which can change over time.

Central banks can differ in the transparency of foreign exchange interventions, for example, in policy transparency or operational transparency. In Latin America, policy transparency is observed more often than not. Operational transparency is used less frequently, to mitigate potential idiosyncratic arbitrage opportunities that could undermine intervention effectiveness.

Regardless of the degree of transparency of foreign exchange intervention, another dimension in this taxonomy is whether the central bank operates under a rules-based or discretionary framework. If under a rules-based framework, foreign exchange intervention oftentimes establishes clear thresholds to trigger the intervention in the market. It can even specify the type and volume of the intervention. At the other extreme, sometimes we have observed Latin American central banks to intervene in a discretionary manner, with no precommitment or announcement. The use of rules and discretion vary by country and over time. Moreover, most countries in the region have used discretion at some point in time and a rules-based framework at others. The costs and benefits of each of these frameworks depend on time-varying needs, the type of shocks to which countries

are exposed, the nature of the monetary policy framework in place at that time, and the development of a country's financial markets, among other things.

For example, in the aftermath of the deepest financial crisis in recent history, emerging market economies experienced large shifts in foreign exchange market conditions, and many central banks adjusted their market operations to the evolving market and policy backdrop. In some cases, concerns for financial stability led to more frequent use of discretionary and less transparent foreign exchange intervention than before. Large and rapidly shifting capital flows and widening currency mismatches seem to have added support to policies aimed at containing exchange rate volatility and providing the private sector with insurance against exchange rate risks.

Going into a more operational territory, we then delve into the details of the type of instrument and modality used for the foreign exchange intervention. Latin America has extensively used a wide variety of intervention instruments, including forwards, swaps, repos, NDFs, and options, as well as US dollar–linked debt. More than one of these instruments has been used by the region's central banks because of the structure and growing sophistication of their financial markets and the multiplicity of objectives.

Furthermore, to avoid affecting the monetary policy stance when intervening, as given by the market interest rate, central banks have been driven to use instruments that reduce the pressure on the spot foreign exchange rate, while reducing distortions from foreign exchange forward market transactions on interest rates. The choice of instrument has also affected the objective of the intervention, which spans from financial stability (the most frequent one), to building buffers, and in some episodes of large depreciation pressures, price stability (to mitigate the effect and potential nonlinearity of the exchange rate pass-through to domestic prices).

Thus, the wide arrangement of instruments, modalities, and frameworks for foreign exchange intervention in Latin America reflect the permanently shifting needs, structural country characteristics (such as financial deepness and global integration), and short-run objectives of countries in the region. It is not surprising that the taxonomy of foreign exchange interventions is extensive. Using this taxonomy as an encompassing framework, Chapters 7 through 13 detail interventions in Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, and Uruguay, respectively.

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CHAPTER 6

Intervention under Inflation Targeting

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This chapter takes a close look at the experience with intervention under inflation-targeting frameworks in Latin America. In particular, it discusses the challenges of combining foreign exchange intervention with the commitment to inflation targets, and how central banks in the region have dealt with that challenge. Further, the chapter compares the transparency and predictability in foreign exchange intervention with that of the standard monetary policy instrument (for example, the policy rate) for inflation targeting. Finally, the chapter investigates the extent to which buy and sell interventions have been symmetric, the costs of intervention, and its pros and cons in the presence of high financial dollarization. A key takeaway is that clear communication and transparency policies may have been instrumental in conveying the subordination of the intervention policy to the inflation objective, thus keeping inflation expectations anchored and building the credibility of central banks.

INTRODUCTION

The analysis in the book thus far has mostly skirted the relationship of foreign exchange interventions with the broader monetary policy framework, the topic of this chapter. The experience of several Latin American countries with decidedly hybrid policy frameworks—in which inflation targeting and (sometimes very frequent) foreign exchange interventions have now coexisted for a considerable period—is of broader interest and provides a rich source for study.

The chapter highlights specific tensions and trade-offs that inflation-targeting central banks face when they intervene, and it discusses how Latin American central banks have dealt with them. It concludes that monetary authorities appear to have successfully handled these tensions, helped by communication policies that managed public inflation expectations.

The views expressed in this chapter are those of the authors and should not be attributed to the IMF.

Challenges of Combining Intervention with Monetary Policy

An inflation-targeting central bank should, by construction, focus monetary policy on its inflation target and allow the exchange rate to float freely. In theory, its response to exchange rate movements should not go beyond the pass-through to inflation and inflation expectations (that is, second-round effects). But as documented in other chapters, Latin American inflation-targeting central banks have continued to care about, and indeed sought to influence, in some cases, developments in the exchange rate for reasons beyond its impact on inflation.

Figure 6.1 shows that the volumes of intervention have not been trivial in the region. As discussed in Chapter 2, the motivations for this are manifold. In particular, currency mismatches on borrowers' balance sheets—a key issue in several countries in the region—can lead to financial stability concerns, which are often within the central bank's mandate. Sharp movements in the exchange rate may also have nonlinear effects on inflation expectations, particularly if there are credibility concerns. That is, even if the pass-through is perceived to be relatively small, sharp movements may have confidence effects and lead to more agents changing their prices based on the exchange rate.

In practice, Latin American central banks have used foreign exchange intervention as the main instrument to achieve exchange rate objectives and address such concerns. Having this additional tool has given these central banks more options, and it may have improved overall policy outcomes. In particular, foreign exchange intervention has arguably helped mitigate the impact of shocks to the exchange rate, while allowing central banks to maintain the primacy of their inflation objective (along the lines argued in Ostry, Ghosh, and Chamon 2012). As such, the use of foreign exchange intervention may have created the space for central banks to focus interest rate policy squarely on inflation.

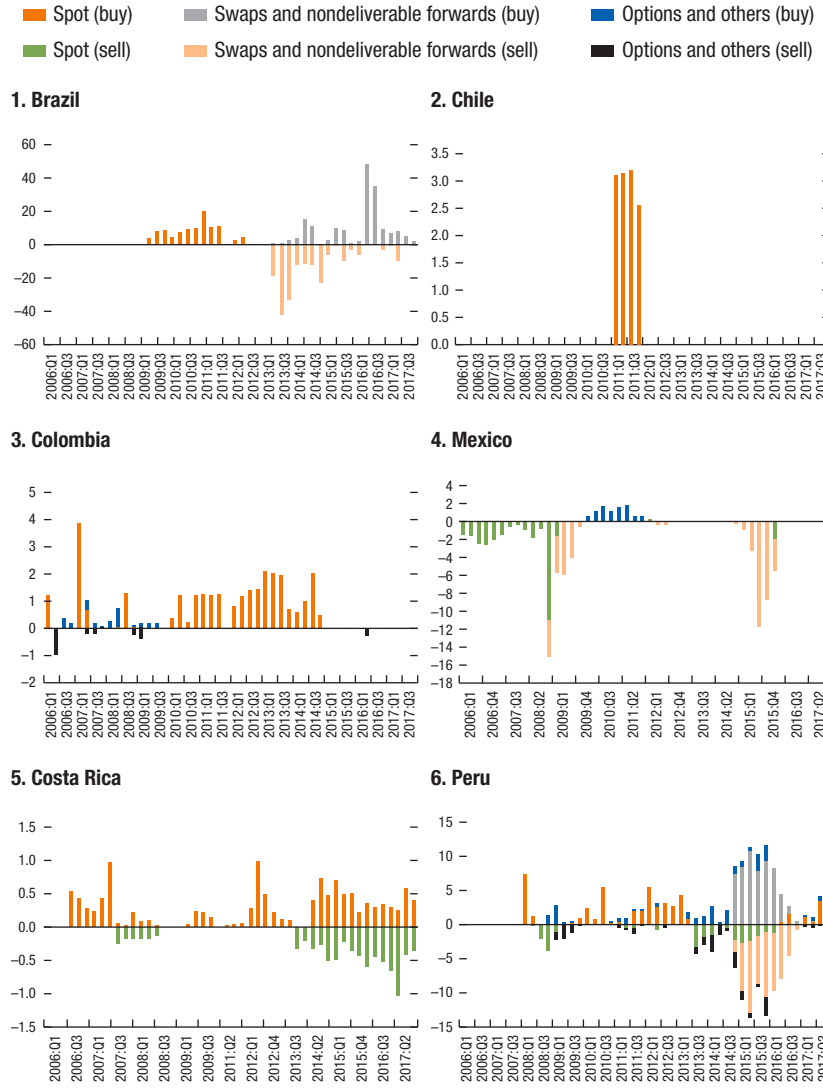
The use of foreign exchange intervention, however, involves considerable trade-offs. For one, its use could send mixed signals to the general public about the central bank's objectives and thereby undermine the credibility of its commitment to the inflation target. Generally, it appears that Latin American central banks have managed this potentially important tension well. Inflation expectations have mostly remained anchored at the target in Latin American countries, including for frequent interveners (such as Peru) or for those that experienced a temporary increase in size and frequency of intervention (such as Mexico in recent years) (Figure 6.2).[1,2]

This has been, in part, supported by clear foreign exchange intervention communication strategies. Central banks in the region have published official communiques whenever they have put in place programs for purchasing international reserves or when they adjusted intervention rules. This information was readily

[1]Inflation expectations became unanchored in Brazil but for reasons that were unrelated to foreign exchange intervention.

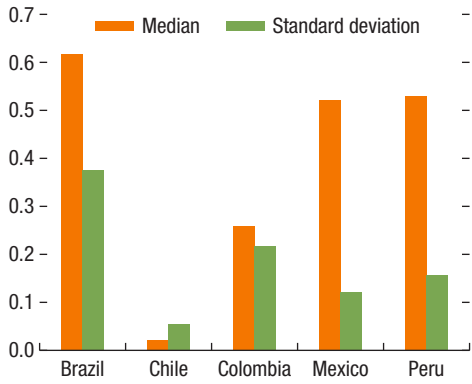
[2]In Uruguay, however, inflation is more volatile and not as strongly anchored as in other countries. In part, this could be because Uruguay is the only country that stopped using inflation targeting when it moved back to monetary aggregate management in July 2013.

Figure 6.1. Foreign Exchange Intervention in Latin American Countries, by Instrument and Exchange Rate
(Billions of US dollars, left scale)



Sources: Central banks; and IMF staff.
Note: Data are by quarter for each year.

Figure 6.2. Annual Deviation of Inflation Expectations from Target, 2010–17
(Percentage points)



Sources: Central bank data; and IMF staff calculations.

available to the public, including on central bank websites. At the same time, when intervention was implemented, central bank authorities would spread the message by educating markets and the public as needed. In addition, even if intervention was discretionary, information and data disclosure policies have been very transparent (see Chapter 3). These communication efforts also contributed to an understanding that even when intervention was deemed necessary, central banks did not deviate from their commitment to price stability. This may have helped maintain the credibility of the central banks' inflation targets.

A possible trade-off also pertains to the interaction between exchange rate and inflation developments. A simple assignment of tools (policy rate for inflation; foreign exchange intervention for smoothing excess exchange rate volatility) may provide a framework to communicate policy and to analyze the trade-offs involved. But foreign exchange interventions will still have spillovers to monetary policy. Even if intervention is fully sterilized, any effects on the exchange rate will have implications for prices and domestic demand. When a central bank decides to intervene, the extent of the intervention and its traction therefore matters for the fine-tuning of monetary policy. For example, if foreign exchange sales significantly slow the pace of depreciation, they may shorten the monetary policy tightening cycle required to reduce inflationary pressures, and vice versa. And given the uncertainties about the effectiveness of intervention, fine-tuning this policy mix can be a considerable challenge. In principle, the impact of intervention on the exchange rate should be front-loaded (in the sense that intervention should affect the exchange rate on impact, and if anything, the effect will only become weaker over time). This attenuates the coordination problem, as the

exchange rate would have adjusted by the time the policy rate needs to be fine-tuned again. In other words, intervention likely has a short transmission lag, which would facilitate coordination with other policies.[3] Conversely, however, the effect of intervention may be temporary (as some of the evidence presented in Chapter 4 suggests). Uncertainty over its persistence can complicate the decision of how to take foreign exchange interventions into account when setting the policy rate. Matters become even more complicated if the exchange rate response incorporates the market's expectation of future interventions by the central bank, as temporary effects fade.

Given the close interaction between exchange rate and inflation, some central banks elsewhere in the world have used exchange rates, at least partially, as an operating target to help achieve the inflation objective.[4] For instance, the Monetary Authority of Singapore uses the nominal exchange rate as the instrument of monetary policy. The exchange rate is sometimes also used as a temporary instrument when other transmission channels are impaired. For example, in 2013, the Czech National Bank used the exchange rate as an additional monetary policy instrument to fight deflationary pressures while at the zero lower bound. This latter case illustrates the use of the exchange rate as an instrument of monetary policy even in an inflation-targeting context. The Latin American central banks in this book, however, generally rely on the policy rate as their policy instrument and have not declared the exchange rate a formal operating target under their inflation-targeting strategies.

The literature and country experience provide limited guidance for deciding how to best integrate foreign exchange intervention into monetary policy decisions. But central banks arguably already face similar challenges in the absence of intervention. For example, whenever there is a shock to the exchange rate, central banks must choose whether they view it as persistent or transitory when deciding whether to adjust policy. While mistakes can be made on that assessment, opportunities often exist to adjust mid-course (for example, lengthening or shortening a monetary policy cycle as the shock proves more or less persistent). Central banks do not publish any hard numbers on the perceived effectiveness and persistence of their foreign exchange intervention. While they may have internal models to inform decisions, if the academic literature is any indication, that guidance is likely incomplete. This suggests there is a good amount of trial and error when implementing intervention policy.

[3]What makes monetary policy challenging is the long transmission lag for the policy rate to affect domestic demand and prices. If intervention had a similarly long transmission lag, combining the two policies would be even more challenging.

[4]Disinflation in several Latin American countries was carried out through "crawling peg" schemes. Once inflation stabilized at acceptable levels and inflation expectations were anchored, these countries moved to flexible exchange rates and eventually to a full-fledged inflation target, using the interest rate as the policy instrument.

Has the Response to Appreciation and Depreciation Pressures Been Symmetric?

Central banks facing excessive appreciation have typically responded by increasing international reserves accumulation—often trying to mitigate the negative impact of stronger currencies on competitiveness, owing to Dutch disease. A simple (perhaps simplistic) view is that the intervention response to appreciation and depreciation pressures should be symmetric, particularly for small shocks. But matters become more complicated in the face of large shocks. Countries can run out of reserves when they respond to depreciation pressures, while there is no upper bound on their reserve accumulation when responding to appreciation pressures. The cost of policy errors may also be asymmetric as overaccumulation of reserves may be easier to correct or accommodate than overdeployment. For example, if a central bank feels it has accumulated too many reserves, it can simply stop accumulating reserves until the stock of reserves comes in line with its precautionary needs, or it can gradually unwind some of these reserves (see Chapter 11 on Mexico). But an excessive loss of reserves can prove costlier, especially if the central bank is perceived ex post as having tried to maintain an unsustainable level of the exchange rate. These issues are particularly pertinent if the stock of reserves is relatively low, leaving the economy more vulnerable to external shocks.

In line with this intuition, countries have proved far more willing to accumulate reserves than to deploy them. Some examples include Brazil and Mexico. Brazil did engage in a large-scale intervention program through swaps. At the peak of that program, the stock of swaps (which settled in local currency) corresponded to about one-third of the stock of reserves. Mexico deployed about 10 percent of its reserves in 2015–16. The relative extent of foreign exchange sales was much smaller in other countries in the region. The observed asymmetry of interventions suggests that, in practice, intervention policies affect not only short-term volatility but can also affect the longer-term trend of exchange rates. This, in turn, has implications for monetary policy.

Costs of Intervention

The discussion so far abstracts from the pecuniary cost of intervention. As mentioned in Chapter 2, there is no consensus in the profession as to the exact nature of these costs. But several observers have focused on the differential between domestic and foreign interest rates as the cost of intervention. That metric has some drawbacks, however. For instance, it does not take into account the extent to which reserves reduce risk premia. Nonetheless, the interest differential can provide a useful first approximation of the cost. Normally the cost of holding reserves should not deter central banks from accumulating reserves until precautionary needs are met. Past that point, however, significant costs would warrant a close look at the marginal benefits of any further accumulation. Each percentage point of interest differential implies that the carrying cost of

10 percent of GDP worth of reserves is 0.1 percent of GDP. That is no small figure. And in practice, countries have much higher stocks of reserves and face much wider interest rate differentials. Costs can be amplified if reserve accumulation is a one-way street (that is, countries accumulate permanent reserves even in response to transitory shocks).

Transparency and Communication

The predictability of inflation-targeting central banks, when it comes to monetary policy, contrasts with the predictability of foreign exchange intervention. Inflation targeting implies having clear, transparent rules for the implementation of a central bank's monetary policy to anchor inflation expectations at the target. When it comes to foreign exchange intervention, we observed in other chapters that the region has an inclination for rules over discretion. Yet, we also document that rules are often updated, and that central banks switch from rules to discretion over time, and vice versa.

It is conceptually useful to compare the transparency embedded in anchoring inflation expectations under inflation targeting to that of foreign exchange intervention. One of the virtues of inflation-forecast targeting is that, based on the most recent and broad-based data available, interest rates are set to achieve the inflation forecast on the central bank's policy horizon. If no further shocks were to occur, the interest rate path would ensure that inflation would match the current inflation forecast. That is how anchoring of inflation expectations is achieved. Of course, unexpected shocks do happen. And central banks need to reflect these shocks in their future policy decisions to keep inflation expectations anchored in the inflation forecast at any future point in time. Transparency and effective communication are key in this process, including conveying to the market the relevant data used by the central bank to compute its inflation forecast. Latin American central banks provide this information, for the most part. This communication and transparency includes, among other things, monetary policy reports, data available on central banks' websites, expectation surveys, board member speeches, and so on. Monetary policy rates are adjusted in a fairly gradual manner. And markets have developed a sense of under which circumstances (and by how much) monetary policy could be adjusted following different shocks.

There is nothing remotely close to that framework when it comes to the communication of intervention policy. Even when intervention is rules-based, there tends to be frequent changes to the rules in response to exchange rate market developments. For example, Mexico increased the volume or lowered the trigger for its intervention rules in 2015, as depreciation pressures proved more persistent than originally anticipated. This contrasts with having an overarching contingent rule or framework in place that could accommodate a wide range of shocks and both appreciation and depreciation pressures as they materialize.

There are important differences between the inflationary process and the exchange rate. One major difference is that stabilizing inflation is *the* objective of monetary policy. As a result, we should not expect intervention, even when rules

are clearly spelled out, to necessarily have the same stabilizing effect on the exchange rate as, say, a Taylor rule would have on inflation. Indeed, foreign exchange intervention, whether based on rules or discretion, appears not to anchor expectations for exchange rate volatility in the way that inflation expectations are anchored with inflation forecasts. In fact, it is not uncommon to observe spikes of market volatility or disorderly conditions even when there are rules dictating when and how much the central bank would intervene. It is worth stressing that this discussion does not factor in the operational secrecy discussed in Chapter 3—as opposed to the transparent operational mechanisms of monetary policy implementation.

Intervention by Latin American central banks is already among the most transparent. Further improvements in communication could help financial markets better internalize the reaction function of the central bank to sharp and unstable movements in exchange rates. The more this internalization occurs, the less likely that actual intervention will be necessary. This then matters in mitigating excessive intervention—closing a virtuous cycle of anchoring exchange rate volatility expectations; that is, disorderly market conditions may be prevented by the expectation of intervention through clearly communicated rules should those conditions arise, thereby reducing the need for actual intervention. If so, and to the extent that such anchoring does not prevent needed adjustments in the level of the exchange rate, in response to structural shocks, this could also help keep inflation stable. Thus, it contributes to achieving central banks' inflation targets.

Interventions and Currency Mismatches

As discussed in Chapter 2, the presence of significant currency mismatches or dollarization can raise financial stability risks associated with exchange rate volatility. They are therefore often cited as a motivating factor for foreign exchange interventions. Banks in highly dollarized countries often lend in foreign currency to borrowers with little or no foreign exchange earnings. This does not eliminate the currency risk, which is just transferred to the borrower. In fact, it transforms it into a higher credit risk, since the borrower would struggle to repay in the event of a significant exchange rate depreciation. In such circumstances, depreciation can increase the amount of nonperforming loans and potentially induce a financial crisis. In addition, banks' dependence on foreign currency liabilities (as core funding decreases) can put pressure on international reserves when central bank liquidity support is needed. If currency mismatches are widespread, therefore, interventions to smooth exchange rate adjustments can help ease the pressures related to short-term fluctuations by providing borrowers with a window on which to hedge their balance sheet risks and reduce currency mismatches. Arguably, by reducing sharp, short-term movements in the exchange rate, interventions may also help prevent panics and self-fulfilling runs on foreign currency.

At the same time, however, intervention can provide adverse incentives for economic agents and facilitate, or even encourage, currency mismatches. As mentioned in Chapter 2, large foreign exchange reserves may encourage risky liability structures; for example, as borrowers taking on short-term external debt count on the central bank to provide foreign exchange liquidity if they were to face tighter global financial conditions (Kim 2008). The volatility of inflation relative to that of change in the real exchange rate is an important determining factor for the degree of financial dollarization. Residents 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 (Ize and Levy-Yeyati 2003). Thus an exchange rate that can move freely in both directions makes foreign exchange risk more apparent and introduces a disincentive to financial dollarization. According to Rennhack and Nozaki (2006), allowing greater exchange rate flexibility and refraining from seeking an undervalued currency discourages financial dollarization. Similarly, Hardy and Pazarbasioglu (2006) show that greater two-way exchange rate flexibility may deter foreign currency deposits, as they increase the risk of holding foreign currency assets.

Among the countries examined in this book, dollarization continues to be an issue mainly for Costa Rica, Peru, and Uruguay (Box 6.1). In part because of this structural vulnerability, Peru intervenes more frequently than many of its peers. While these interventions have helped smooth exchange rate volatility in Peru, by limiting upside exchange rate risks, and may thus have helped stave off financial stability risks, it is also possible that they have incentivized continued dollarization or contributed to a slower de-dollarization.

CONCLUSION

The experience of Latin American central banks with foreign exchange intervention under inflation-targeting frameworks has been instructive. While there can be inherent tensions between the effective pursuit of exchange rate objectives alongside an inflation target, Latin American central banks, on balance, appear to have managed these tensions with considerable success. Clear communication policies appear to have played a key role. Indeed, these may have been instrumental in maintaining the primacy of the inflation objective and facilitating a relatively firm anchoring of inflation expectations as the inflation-targeting frameworks gained credibility. Moreover, a transparent and well-communicated foreign exchange policy appears to have helped the market internalize the central bank's reaction function. It also contributed to understanding that these interventions were subordinated to the interest rate policy aimed at anchoring inflation expectations. The Latin American experience thus suggests that this internalization can enhance the effectiveness of intervention and inflation stabilization more generally, while helping improve the credibility and effectiveness of the central bank.

Box 6.1. Dollarization in Latin America

Latin America has countries with persistently high dollarization as well as countries that have avoided financial dollarization altogether.

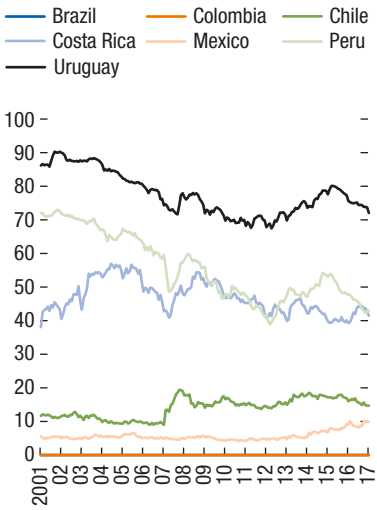
During 1990–2001, dollarization rose markedly in several countries, including Bolivia, Costa Rica, the Dominican Republic, Honduras, Nicaragua, Paraguay, Peru, and Uruguay (Rennhack and Nozaki 2006). Thereafter, some of these countries—in particular, Bolivia, Paraguay, and Peru more recently—have managed to achieve a significant reduction in dollarization.

Most of the countries that are part of our study in this book, such as Brazil, Chile, Colombia, and Mexico, have avoided significant dollarization (Figures 6.1.1 and 6.1.2), despite experiencing severe macroeconomic problems in the 1980s. The availability of indexed financial instruments helped prevent dollarization in the cases of Brazil and Chile (despite the former experiencing a hyperinflation). In other countries, however, such as Peru, the public responded by switching away from the domestic currency toward dollars. Today, dollarization remains high in Peru despite more than two decades of prudent macroeconomic management, albeit with a declining trend.

While dollarization continues to be an issue in selected economies only, even countries that never experienced domestic dollarization still experienced significant currency mismatches on the liability side as governments, banks, and firms accessed international financial markets in the 1990s, thus accumulating foreign debt. These mismatches contributed to currency crises in Mexico in 1995 and in Brazil in 1999.

Figure 6.1.1. Deposit Dollarization, 2001–17

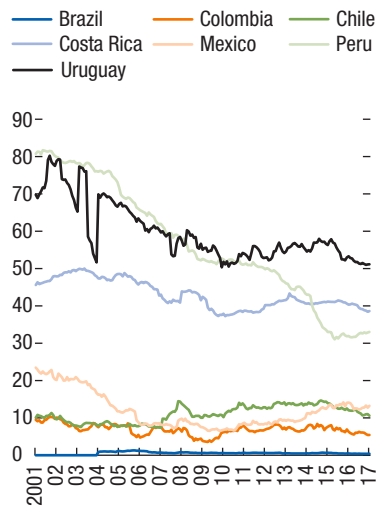
(Ratio of foreign currency deposits to total bank deposits, percent)



Source: IMF staff calculations.
Note: Data are from December of each year.

Figure 6.1.2. Loan Dollarization, 2001–17

(Ratio of foreign currency deposits to total loans, percent)



Source: IMF staff calculations.
Note: Data are from December of each year.

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Rennhack, Robert, and Masahiro Nozaki. 2006. "Financial Dollarization in Latin America." IMF Working Paper 06/07, International Monetary Fund, Washington, DC.

This book is a wonderful reference for anyone interested in foreign exchange markets. While the focus is on Latin America, the analytical, general policy, operational, and technical issues studied in these chapters have global appeal. For academics, it brings an older literature up to date in the context of the shift to greater exchange rate flexibility and the comparatively newer practices of central banks with inflation targeting. For policymakers, it is essential reading, as it provides a discussion of both general considerations in intervention strategies and country case studies with a rich array of experiences. For financial market participants, understanding central banks and their policies forms an integral part of informed investment decision making.

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This book helps fill an important information gap. And it does it with evidence and firsthand policymaking experience, with a focus on Latin America. Both practitioners and academics would benefit enormously from reading the chapters of this book. There is still an apparent void between theory and practice when dealing with emerging markets foreign exchange intervention. In theory, pure floating, with no intervention, suits well an inflation-targeting regime. In practice, most emerging markets accumulate reserves and intervene in one way or another in their markets, especially in moments of stress. Why and when should emerging markets intervene? Helping markets function and providing liquidity in moment of stress is part of the answer. But how rare should interventions be? And how should one intervene? Should interventions occur in the spot or in the forward markets? How should inflation-targeting regimes be run when interventions are necessary? The discussion of these and other related topics makes this book an important reference for policymakers, for emerging markets investors, and for those studying international finance.

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