Currency Boards in Retrospect and Prospect

Holger C. Wolf, Atish R. Ghosh,
Helge Berger, and Anne-Marie Gulde

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To our parents

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Series Foreword

This volume is part of the CESifo Book Series. Each book in the series aims to cover a topical policy issue in economics. The monographs reflect the research agenda of the Ifo Institute for Economic Research, and they are typically "tandem projects" whereby internationally renowned economists from the CESifo network cooperate with Ifo researchers. The monographs have been anonymously refereed and revised after being presented and discussed at several workshops hosted by the Ifo Institute.

Preface

Currency boards, more so than other exchange rate regimes, have come in and out of fashion. Defined by a fixed exchange rate with full convertibility, central bank liabilities backed by foreign exchange reserves, and a high cost of exiting the regime, currency boards were common in colonial times—falling into disuse as these countries gained independence. But in the 1990s, currency boards enjoyed a dramatic comeback as the cornerstone of various macroeconomic stabilization programs, including many in European transition economies—only to fall into disrepute again with the collapse of the Argentine regime in 2002, which overshadowed their continued successes elsewhere.

In this book, we try to cut through the hype and examine why currency boards might be expected to foster monetary stability, whether they in fact deliver low inflation and—if so—at what cost, and what role they have played in the transformation of various central and eastern European countries from centrally planned to market economies, and what role they may play in obtaining eventual membership in the Economic and Monetary Union (EMU).

We begin with a brief look at the antecedents of the modern currency board arrangements, the early currency boards widely used in the first half of the twentieth century. We then develop a simple theoretical framework that articulates the advantages and drawbacks of currency boards compared to both flexible regimes and traditional pegs, and conclude part I with a closer look at the institutional structure of modern currency boards to see how theoretical constructs map into operational practice.

In part II, we make use of a large panel dataset—covering virtually all International Monetary Fund (IMF) member countries over the period 1970–2002—to examine the performance of key macroeconomic variables such as inflation, real GDP growth, and output volatility

under currency boards relative to other regimes, using several robustness tests to examine the importance of regime endogeneity.

The evidence suggests that currency boards are indeed robustly and causally associated with lower inflation. The difference reflects both discipline effects (lower monetary growth) and credibility effects (lower inflation for given rate of monetary growth). The better inflation performance does not come at the cost of slower growth or a worse trade performance. Indeed, if anything, growth is higher than under other exchange rate regimes, though this may reflect a rebound from the depressed levels typically found at the time when currency boards are adopted. While output volatility is greater than under flexible exchange rates, it is no higher than under other pegged exchange rate regimes. Finally, currency boards are not associated with any greater susceptibility to financial crises.

The panel evidence on currency boards is thus quite strong. Yet what about Argentina? In the early 1990s, supporters of currency boards were quick to claim credit for Argentina's disinflation success, while skeptics argued that the stabilization, if it held, reflected a fundamental shift in fiscal preferences, and would have also taken place under a traditional peg. In a mirror image, the spectacular collapse of the Argentinean convertibility regime in 2002 was seized upon by skeptics as proof that—whatever their temporary benefits—currency boards lack staying power and dissolve in costly crises, while proponents argued that the crisis occurred not because of, but in spite of, the currency board, and reflected a fundamental absence of fiscal discipline. Whatever view one ultimately takes, any comprehensive discussion on the (de)merits of currency boards must confront this episode. To this end, we round out part II with a close look at Argentina's experience under its currency board regime.

In part III, we turn to the four most recent European currency boards: Estonia (1991), Lithuania (1994), Bulgaria (1997), and Bosnia and Herzegovina (1998). Next to Argentina, these central European currency boards have received most attention. Although adopted for different reasons and in somewhat different circumstances, they aim for the same ultimate exit from their currency boards into Eurozone membership. To be sure, time frames vary widely. Estonia and Lithuania entered the EU in May 2004 and ERM-II a month later. Subject to satisfying the inflation convergence criteria, Estonia and Lithuania are expected to join the EMU in the not too distant future. For Bulgaria, which entered the EU in January 2007, EMU membership will likely

not come before 2010, while for Bosnia and Herzegovina even EU membership is presently far off.

The expectation that these countries will eventually adopt the euro allows them to sidestep the Argentinean challenge of maintaining credibility in the face of public debate about whether, when, and how to exit. The gain comes at the cost of some additional complexity, notably the timing and mechanics of transition from a currency board to full-fledged EMU membership. In part III, we explore the structure, performance, and likely future of the European currency boards in comparative perspective.

Acknowledgments

In writing this book, we have incurred many professional and personal debts. We particularly thank Hans-Werner Sinn for his interest, making this book possible. We are indebted to Michael Burda, G. Russell Kincaid, Rolf Langhammer, Carmen Reinhart, Dennis Snower, Emil Stavrev, DeLisle Worrell, Charles Wyplosz and participants in seminars at CESifo, the Austrian National Bank, and the Institut für Weltwirtschaft, Kiel, for many useful and insightful comments. We are grateful to Siba Das, who was enormously helpful in assembling the database used in this book. Thanks are also due to Charles Enoch, Juha Kähkonen, and Peter Keller, who have worked with one of the authors on related papers. While we have benefited enormously from talking to colleagues at the IMF, including desk officers covering the countries in our case studies, we stress that the views expressed herein are our own, and do not necessarily reflect those of the International Monetary Fund.

1 Introduction

The record shows that, for a country with a history of extreme monetary disorder, introducing a currency board is a way to gain credibility for monetary policy more rapidly and at a lower cost than appears possible any other way.

—Stanley Fischer, "Exchange Rate Regimes: Is the Bipolar View Correct?"

There are countries in which they [currency boards] *seem to work for a while; however, these countries are successful not because of the CB system itself but rather because they follow macroeconomic policies and structural liberalization policies that are consistent with the maintenance of fixed rates.*

—Nouriel Roubini, "The Case against Currency Boards: Debunking 10 Myths about the Benefits of Currency Boards"

In addition to showing that CBSs [Currency Board Systems] *deliver stability, the data clearly contradict the preconditions dogma . . . It is time for economists to stop worrying about whether Currency Board Systems can work in theory and to start accepting and grappling with reality.*

—Steven Hanke, "The Disregard for Currency Board Realities"

Much like the haute couture paraded down the catwalks of Paris and Milan, exchange rate regimes waft in and out of fashion. Currency board arrangements (CBAs) provide a telling illustration. This type of exchange rate arrangement—defined by a fixed nominal exchange rate (with full convertibility), a coverage rule whereby central bank liabilities are backstopped by foreign exchange reserves, and a high cost of exiting the regime—originated in colonial times and was once one of the dominant regimes in small open dependent territories, but was soon abandoned as these countries gained independence. After enjoying a dramatic comeback during the 1990s as the cornerstone of various macroeconomic stabilization programs—including several

in central and eastern European transition economies—they have again fallen into disfavor after the collapse of the Argentine currency board.

These shifting fortunes played out against the backdrop of the broader debate on the merits of fixed versus floating exchange rates. The demise of Bretton Woods ushered in an era of floating exchange rates seemingly promising an end to the traumatic balance of payments crises of the 1960s and the freedom to pursue activist stabilization policies. Yet the experience of the 1970s and 1980s showed how easily policy discretion could also be abused. Against the background of rising inflation—even hyperinflation in some cases—the pendulum swung back; pegging the nominal exchange again became a fashionable way to stabilize the economy by importing the credibility of the anchor currency. But the renaissance of traditional adjustable pegs was short-lived, rudely disrupted by the spectacular collapses of the Asian pegs in 1997–1998, followed closely by those in Russia and in Brazil.

Observers of these episodes drew starkly different lessons. Some attributed the collapses to a fundamental weakness of fixed exchange rate regimes in a world of high capital mobility, seeking the solution in more flexible exchange rate regimes. Others, while sharing skepticism about the sustainability of traditional pegs, drew a rather different conclusion. For them, the weakness of traditional pegged exchange rate regimes stemmed from their inability to restrain fiscal mischief and doubts about whether the monetary authorities would really have the stomach to defend the parity by raising interest rates aggressively should the need arise. The solution was therefore to be found not in more but in less flexibility, replacing traditional adjustable pegs by hard pegs.

Alongside dollarization,[1] currency boards have been the hard-peg regime of choice. Their renaissance was unexpected. While early currency boards had performed well, delivering monetary stability and generally sound macroeconomic performance, they were tainted by their colonial roots and had been abandoned in the 1950s and 1960s in the course of independence movements.[2] By the mid-1970s, currency boards appeared headed for the monetary curio cabinet, with only a handful of these arrangements remaining, mainly in very small, very open economies.

The revival began in Asia. Hong Kong, the last significant economic power to operate under a currency board, had exited the arrangement

in 1972.[3] But during the subsequent decade of increased inflation and financial instability, the currency board regained appeal, eventually prompting Hong Kong to return to a currency board system in 1983. While notable, Hong Kong's special economic and political circumstances limited the impact of its decision on the global debate. By contrast, Argentina's decision in 1991 to readopt[4] a currency board as a last-ditch effort to stabilize an economy wrecked by repeated bouts of hyperinflation and failed stabilizations, together with its initial dramatic success, captured the world's attention—much as its collapse a decade later would overshadow the continuing success of similar arrangements in other countries.

By the late 1990s, the currency board club had grown to include Bosnia and Herzegovina, Bulgaria, Estonia, and Lithuania, alongside the small set of surviving near-classical boards in Brunei, Djibouti, the Falklands, and St. Helena as well as the multicountry Caribbean board.[5] Currency boards were also actively debated—though ultimately not adopted—in a number of other countries going through economic or political turmoil, including Indonesia during the 1997–1998 East Asian currency crisis,[6] Russia in the aftermath of the August 1998 devaluation,[7] Brazil during the 1999 defense of its exchange rate peg,[8] Mexico,[9] Poland[10] Iraq,[11] Palestine,[12] as well as numerous smaller countries or territories (Ecuador, El Salvador, Kosovo, Mongolia, Montenegro, Nepal, the West Bank and Gaza, and East Timor).

Despite their newfound popularity, currency boards also faced profound skepticism long before the 2002 Argentine crisis.[13] The (continuing) debate centers on whether currency boards can truly deliver low inflation in situations where policy credibility may be severely lacking. And, if so, can these gains be achieved at an acceptable economic and social cost?

In theory, yes. The defining characteristics of a currency board should all contribute to policy discipline and credibility. The fixed exchange rate provides a highly transparent and easily verifiable metric of the value of the domestic currency; the backing requirement guarantees that the central bank is always able to honor its monetary liabilities (and cannot simply "print money" unless it has excess reserves to back them). The high exit cost generates a significant political penalty for monetary or fiscal mischief that threatens the viability of the regime. Together, these features of currency board arrangements should therefore serve to lower inflationary expectations and reduce the cost of achieving disinflation.

Skeptics counter with three arguments. First, currency boards are only one of a range of mechanisms to establish credibility and lower inflation expectations. Whether they dominate the alternatives—such as central bank independence or capital account convertibility—is not evident. Second, even if there is empirically a positive association between the adoption of a currency board and good inflation performance, this may simply reflect "reverse" causality as countries that are better able and more willing to achieve and maintain low inflation are more likely to adopt a currency board. Put differently, countries that adopt currency boards may be those that have the political will and the institutions to generate good macroeconomic outcomes regardless of their exchange rate regime.

Finally, skeptics like to point out that even if currency boards help bring down inflation, this does not necessarily make them worth adopting, due to their potentially high costs. In particular, a small trend inflation differential relative to the anchor currency could lead to a trend appreciation of the real exchange rate, undermining export performance and slowing economic growth. At the same time, the loss of the nominal exchange rate as an adjustment tool might increase real volatility. Relative to traditional pegged exchange rate regimes, moreover, the additional strictures of a currency board reduce the scope for the central bank to stabilize output (through discretionary monetary policy) or to act as lender of last resort (LOLR) in a financial crisis.

Reflecting these debates, the cost-benefit calculus of currency boards thus is ultimately an empirical issue that depends on three concrete questions: First, do countries with currency boards enjoy significantly lower inflation than countries with other exchange rate regimes? Second, can any such outperformance be causally linked to the exchange rate regime? And, third, do currency board countries suffer from poorer economic performance—output growth, exports, susceptibility to financial crises—than countries with other regimes? In this book, we seek to answer these questions.

I

Currency Boards: History, Theory, and Institutions

2 Currency Boards in Historical Perspective

2.1 Introduction

Currency boards can look back on a long history (Schuler 1992; Schenk 1997). In use since the mid-1800s, their popularity as a monetary arrangement, particularly for dependent territories in the British Empire,[1] peaked in the interwar period. Judged against their stated objective of maintaining monetary stability they performed well, especially given the backdrop of pervasive instability elsewhere.

Given their solid performance, one might have expected currency boards to continue thriving in the postwar period. Yet, by the mid-1970s, their number had withered to a handful, mostly in small and very open economies, reflecting both economic and political factors. On the economic side, fashions had changed toward activist monetary and fiscal policies. Currency boards with their severe strictures held little appeal in this environment. On the political side, boards in dependent territories—typically operated from London—were associated with the colonial regime; they were shed together with other vestiges of the past during the independence movement. The combination of political and economic changes proved decisive: few boards survived into the 1960s, even fewer lasted until the 1970s (figure 2.1).

In this chapter, we take a closer look at the historical evidence, both to provide context for the discussion of the modern boards and to explore whether the early boards hold lessons for their modern counterparts.

2.2 Early versus Modern Boards: Birds of the Same Flock?

Although early and modern currency boards are technically similar —comprising a fixed parity, the backing of (and convertibility into)

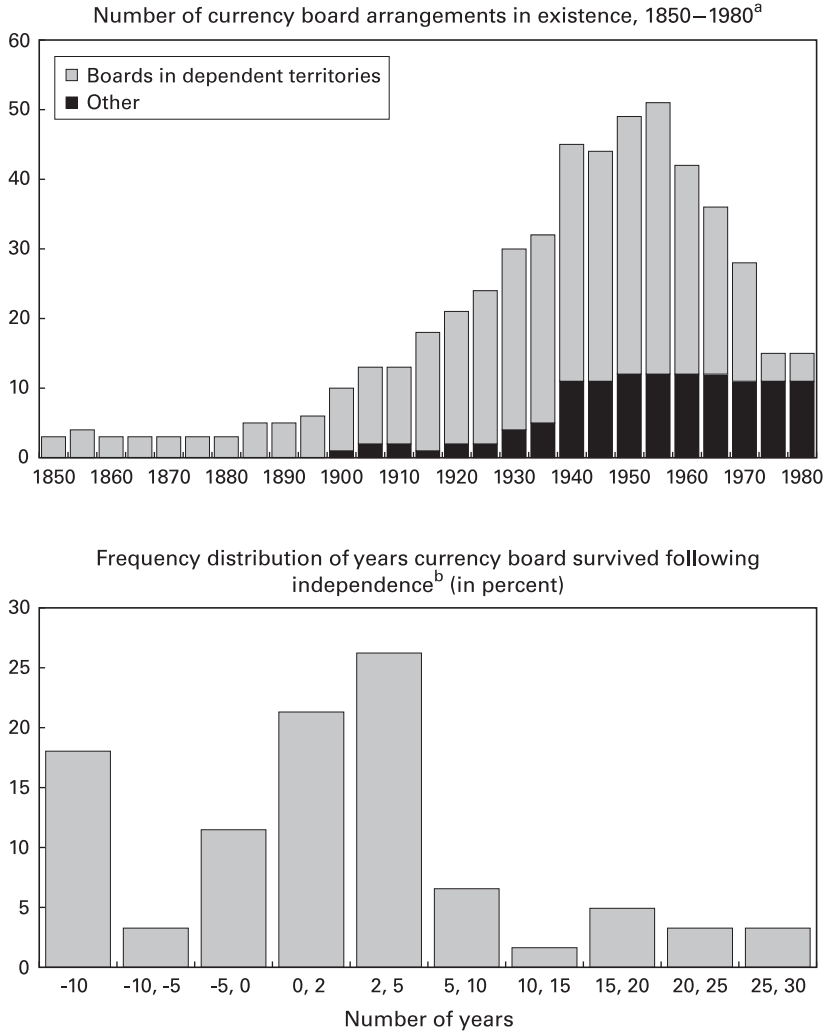

Figure 2.1
Early currency boards
Source: Based on Schuler 1992 (Table 2.1).
[a] "Other" boards consists of eleven currency board arrangements that continue to be in existence and twelve arrangements in countries that either were independent at the time or territories that have never been independent.
[b] Among currency boards in dependent territories, as defined in note a.

Box 2.1
An early credibility-motivated board: Argentina 1891–1935

While the majority of the early boards were motivated by trade rather than by credibility objectives, the first Argentinean currency board, lasting (with interruptions) from the 1890s to the 1930s in many respects resembles its modern successor in the 1990s. Indeed, in terms of its motivation—and the causes of its eventual failure—it is arguably closer to the modern credibility based systems.

Following independence, reliance on the inflation tax had undermined long-term monetary stability. A first stabilization attempt in 1868 ultimately failed in 1875, followed by a prolonged period of "acute mismanagement of public debt and serious violations of time consistency in economic policies" (Paolera and Taylor 2001, 223) culminating in a de facto debt default contributing to the Baring crisis and the ensuing emerging market crises. Much as was the case a century later, Argentina in 1891 suffered from a lack of international and domestic credibility. The government responded with a maxi-devaluation, the closure of domestic financial institutions and the introduction of a quasi-currency board in the form of the Caja de Conversión, though initially reserve backing was minimal. Until the outbreak of World War I the currency board fulfilled its narrow objectives. The inflation rate declined from an average of 48 percent in 1889–1891 to 6 percent in 1891–1899 and 3 percent from 1899 to 1913 (Paolera and Taylor 2001, 14). In the absence of major shocks, the banking system remained stable, and the backing ratio gradually rose to almost three quarters as Argentina enjoyed a golden period of economic growth.

From 1913 onward tensions began to mount. In 1914 the export of gold was suspended while adverse terms of trade movements placed persistent pressure on the system. The export prohibition was only lifted in 1925; the gold standard reestablished in 1927. The return was short-lived as "a series of economic shocks polluted first the private banking system and then, despite a seemingly solid design to prevent bailouts and moral hazard, took down the Banco de La Nación and the Conversion Office [the Currency Board] as the illness spread" (Paolera and Taylor 2001, 234). Gold convertibility was suspended in 1929, the Caja replaced by a central bank in 1935.

The demise of the first Argentinean board illustrates that the political and public support for currency boards (and consequently their credibility) depends on the continuous reassessment of their cost-benefit trade-off in a broader economic and political context. In the face of major crises, whether home made or exogenous, support for a board can diminish even if the board itself satisfactorily fulfils its narrow goals. This was indeed the case in Argentina: the average inflation rate from 1918–1927 came in at −3 percent, followed by −1 percent during 1927–1929 and 0 percent during 1929–1934.

Box 2.1
(continued)

Paolera and Taylor (2001, 234) conclude that "[a] concise way to sum up Argentina's experience would be to present it as a problem of bad design in the overall financial architecture. Certain elements looked reasonable and stable on their own, but put together the entire edifice could not hold up to the eventual strains." As we discuss later, very similar tradeoffs arose in the run-up to the collapse of the second Argentinean board.

Sources: Paolera and Taylor 2001; Schuler 1992.

domestic monetary liabilities by foreign assets, and a high exit cost—four crucial differences set them apart.

First and foremost is their raison d'être. Early boards were primarily established atop an exiting local monetary system to facilitate international trade;[2] most modern boards aim to establish monetary policy credibility (although Argentina, in a precursor of events to come in the next century, adopted a currency board in 1891 to enhance monetary credibility; see box 2.1). Second, capital flows were—with some exceptions—typically less volatile. Third, the defense of the peg was the unquestioned objective of monetary policy. Finally, a large subset of early boards in dependent territories was introduced and, in practice, largely run by the Colonial Office in London, with limited influence of the dependent territory governments.

In consequence, the very conflict between competing monetary policy objectives underlying the credibility-based case for hard pegs in modern times did not arise for most of the early boards: not only did the prevalent worldview not recognize conflicting objectives to the extent it does today, but even if such conflicts had arisen at the domestic level in the dependent territories, the local governments were institutionally unable to change the monetary policy structure. The differences suggest caution in directly comparing the classic with the modern boards. Nonetheless, their introduction, operation, and termination carry some important insights.[3] In the following pages, we explore the motivation and functioning of the early boards in more detail, focusing on the relatively typical case of the West African Currency Board[5]—though not all currency boards of that period fit this model (box 2.2).

Box 2.2
Ireland: The tranquil currency board

The Irish board differs in several respects from the typical early board. Following independence in 1922, a debate on the desirable monetary system commenced. Informed by a commission headed by Henry Parker Willis of Columbia University, the central banking option was rejected on the grounds that the existing system of private banks with easy access to the London market satisfactorily fulfilled the requirements. Instead, a hybrid public-private currency board was introduced in 1927.

The board was based on a one-to-one parity between the Irish Pound and the British Pound. Six private banks received note issue privileges from the currency commission, backed by (interest paying) reserves held at the currency commission. Throughout its existence, the reserve ratio of the Irish currency board comfortably exceeded 100 percent, providing a limited flexibility to counteract external shocks.

The arrangement softened over time until, in 1943, responding to a second commission report, the board gave way to a central bank, though a minimum coverage requirement was retained. The new central bank initially refrained from using the additional room for maneuver, continuing in all but name to operate as a currency board. Over the subsequent decades, the almost orthodox board gradually morphed into an active central bank, beginning with the resumption of modest lending activities and culminating with the formal abandonment of the legislative approval clause for future parity changes.

By tying its currency closely to Britain—its main trading partner—Sterling's travails unavoidably spilled over to Ireland. Faced with this trade-off, Ireland consistently chose to retain the parity with the British Pound. Despite the sustained exchange rate stability, the trade share with the United Kingdom declined steadily, from a starting level of 96 percent of exports and 75 percent of imports in 1926, to 47 percent and 52 percent in 1978. The changed trade composition influenced the eventual decision to opt for EMS (and subsequently EMU) membership, a transition also achieved with relatively few upheavals.

Sources and further literature: Moynihan 1975; Schuler 1992; Honohan 1997; Lau 1999; Thom and Walsh 2002.

2.3 The Rise and Fall of Early Boards: The Case of the WACB

Though circumstances varied, the typical monetary system in dependent territories was comprised of domestic monies, (multiple) foreign coins, and, to a lesser extent, bank notes. While functional, efficiency was constrained by differences in premia/discounts of the various coins across locations and by the physical problem of paying for large purchases, often in the interior, with heavy coins. The positive network effects of a common monetary standard gradually reduced the problem of multiple circulating currencies, as British coinage became the dominant trade currency. This shift, combined with increasing overall monetization, generated a persistent demand for (silver) coinage in the colonies. While the British Mint satisfied the demand (The Banker, 1948, 94), Treasury officials voiced concerns about the effects of a potential reversal of the flows. The Colonial Office shared the unease about the unregulated colonial monetary situation; it further argued for a share of seigniorage revenues to be allocated to the dependent territories, a proposal resisted by the British Treasury (table 2.1).

A parliamentary committee set up in 1912 to explore these issues proposed the introduction of a local currency convertible into sterling, eventually leading to the creation of the West African Currency Board (WACB), perhaps the best-known early currency board. The creation of the WACB (and subsequent boards partly modeled on it) thus significantly reflected the interests of two London ministries. Indeed, the one issue of interest to the trading companies—the introduction of a convertible paper money—was initially postponed, though the exigencies of war soon made it a necessity.

Table 2.1
Trade features of selected early boards (in percent)

	Export share of UK	Import share of UK	Export share of top three commodities	Imports/ market-based income
Nigeria	77	56	53	11
Gold Coast (Ghana)	43	56	84	37
Kenya	30	57	55	50
Tanzania	40	56	79	n.a.
Uganda	30	53	92	29

Source: Newlyn and Rowan 1954, 6.

The WACB—which we take as a representative example of other boards in dependent territories[6]—was constituted in London and staffed by the Secretary and part-time members drawn from other institutions, primarily the Colonial Office and the Crown Agents.[7] Significantly, the board did not include official representatives from the dependent territories.[8] The board had no authority to alter the institutional structure of the arrangement, including the parity.

Operationally, the board relied heavily on existing financial infrastructures. For the WACB, the private Bank of British West Africa implemented the initial conversion and managed the subsequent convertibility operations under the aegis of a local public official. The British Mint redeemed the exchanged British coinage against sterling notes, thus allowing the WACB to commence its operation with full backing, which it maintained throughout its half-century existence.

Both WACB coins and, after 1916, notes[9] were convertible into sterling on demand in London (and, in practice, at the local offices of the board). The board held the reserves in London in cash and gilt-edged securities. Although prohibited from holding local assets, the boards could hold securities issued by other dependent territories, though minimal use was made of this option prior to World War II. The statutes governing the WACB required it to hold sufficient reserves to ensure convertibility and avoid depreciation, which in practice meant keeping at least full coverage.

The performance of the early boards in terms of the stated objective—exchange rate stability and trade promotion—leaves little to be desired. Throughout a period of pronounced monetary instability in other parts of the world, including hyperinflations in much of central Europe, the early currency boards sustained their exchange rate parities against a background of growing integration with Britain (Schuler 1992; Schenk 1997).

Indeed, the boards were so much part of the overall economic fabric that accountants reportedly often did not distinguish between sterling and local currency in company books. While interest rates exceeded those in London, the premium may reflect transaction costs and credit risk factors—notably the lack of collateral (land) markets—rather than perceived exchange rate risk. The stability may have reflected the structure of the arrangement, providing insulation against political pressures, and perhaps an expectation that the British Treasury, while not obligated to do so, would come to the rescue in case of need.

Table 2.2
A snapshot of the West African Currency Board: 1945[a]

Currency	29.4
Reserves	33.3
of which	
cash	1.8
deposits	2.0
investments	29.5
Reserve/currency ratio (in percent)	114.3
Total income	0.762
of which	
dividends and interests	0.743
conversion premia	0.017
Return on assets (in percent)	2.2
Total cost	0.083
of which	
overhead	0.003
freight insurance	0.020
currency manufacture	0.060
Net profit	0.679

Source: Newlyn and Rowan 1954, 50–53.
[a] In millions of pounds, unless otherwise indicated.

The boards furthermore generated steady profits (table 2.2), satisfying the objective of the Colonial Office. While yields were low—reflecting the need for liquidity and hence short maturities in highly cyclical and seasonal economies with large primary sectors[10] and the investment in low-yield guilt-edged securities—costs were minimal due to reliance on existing infrastructure.

The good performance was facilitated by a banking structure fortuitously well suited to a currency board system. Domestic banking systems were generally small, in many cases hampered by the lack of a functioning land collateral market. Domestic banks consequently largely acted as deposit institutions, holding moderate amounts of short-term domestic loans but primarily investing in U.K. securities. London-based imperial banks served the large trading firms and the expatriate population (Baster 1929; Crick 1965). The imperial banks with access to the London financial market were able to accommodate seasonal swings in money demand while reducing concerns about the

lack of a local lender of last resort. In the case of the WACB, this position was filled by the Bank of British West Africa (BBWA), in turn partly owned by domestic British banks.[11]

What about macroeconomic performance? Data limitations make it difficult to construct a comparable reference group of non–currency board countries. Schuler (1992) instead compares inflation and real GDP growth during and after the currency board years. Using his data, figure 2.2 presents a scatter plot of the average GDP growth rate before and after the exit from the currency board. The clustering of inflation points above, but growth points below, the 45 degree line reveals that most countries experienced an uptick of inflation and a decrease in GDP growth after exiting the currency board. Averaging over all his observations, inflation was 5.5 percent per year during the currency board period and 10.9 percent per year afterward, while growth fell from an average of 3.5 percent per year to 1.6 percent per year. While these are unconditional means, and factors other than the exchange rate regime surely influenced performance, the evidence presented by Schuler casts a positive light on the early experience with currency boards and raises the question—shared by external advisors at the time—whether a compelling economic case could be made for exiting the regimes.[12]

Despite their attractive track record, the early boards seemed headed for the monetary curio cabinet by the mid-1960s. Part of the reason for their faltering appeal was political: perceived as an integral part of the colonial fabric, boards lost support after independence. Yet the disenchantment went deeper. Even prior to independence, a lively debate on the (de)merits of boards had begun. There were important operational challenges—maintaining reserve coverage in the face of pronounced volatility of money demand, the potential deflationary nature of boards,[13] and the divergences between British monetary policy geared toward the requirements of an industrialized economy and the needs of small exporters of agricultural products and commodities. Adding to these operational challenges were concerns about the high opportunity cost of holding substantial reserves in low-return British gilts when there were ample domestic investment needs that presumably carried much higher returns.[14]

These considerations, together with the politics of independence and the general trend toward more activist monetary policies, shifted perceptions. Currency boards were no longer seen as permanent regimes

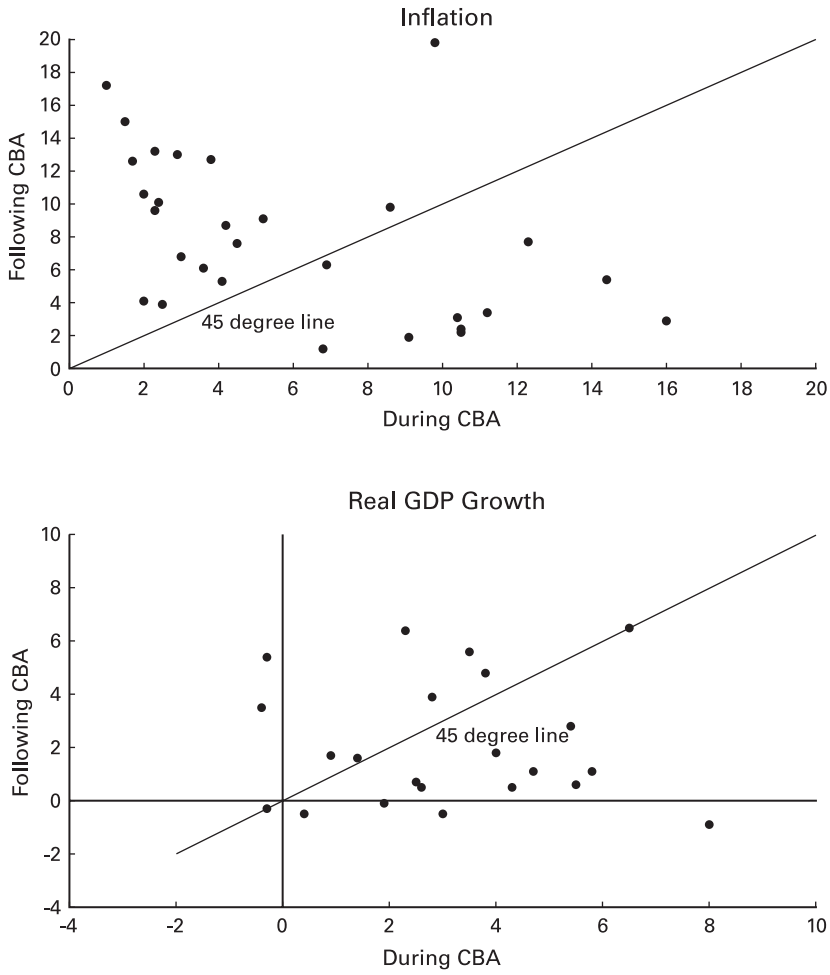

Figure 2.2
Macroeconomic performance during, and following, early currency boards (in percent per year)
Source: Based on Schuler 1992.

but as stepping-stones on the path toward full-fledged central banks. The Bank of England, an influential player in this debate through its advisory function, assumed an ambivalent stance. While not unsympathetic to the evolutionary view over the long run, Bank of England advisors, including J. Fisher in Nigeria and J. Loynes in Ghana, were skeptical about the timing of the transition, questioning whether the financial development stage supported a transition. Such concerns were, however, trumped by politics. Loynes, in a letter to Fisher at the Bank of England sums up the prevailing view: "if we were all fifteen years younger here, a local currency board would be ideal but it is not practical politics" (qtd. in Schenk 1997, 189).[15]

The time to exit had thus come. Two crucial decisions had to be made: whether to opt for a flexible exchange rate regime or to retain a peg; and whether to retain any minimum coverage requirements. With the discussion taking place in the international context of the early Bretton Woods system,[16] the option of exiting to a float did not gain traction; the sterling pegs were retained. Decisions on de jure coverage ratios differed, though de facto the new pegs commenced with full coverage.[17] The new central banks thus commenced their operation in a setting that in practice did not diverge much from the currency board structure, providing a rare natural experiment on the effects of loosening a constraint on future monetary policy absent any pronounced current monetary problems. As it turned out, the transitions from the early currency boards to their successor regime of traditional pegs went smoothly.

2.4 Conclusions

There can be little doubt that the early currency boards delivered on their narrow objectives. During a period of pronounced global monetary instability, the early currency boards achieved low average inflation rates under a credibly pegged exchange rate regime. When their end came, the exits were remarkably unremarkable, sparking neither a crisis nor an immediate loss of credibility. While other factors arguably mattered as well, it is noteworthy that performance slipped after the transition to active central banking (Schuler 1992).

The specific structure of early boards in dependent territories may have played a role (table 2.3). Run out of London by an external agency focused on a single objective—trade facilitation—and supported by the system of imperial banks serving as de facto lenders

of last resort, these boards did not have to confront the trade-offs plaguing modern central banks (and underlying the theoretical case for hard pegs). While the different environment cautions against extrapolating the experiences, their impressive performance over multi-decade periods suggests that currency boards may indeed be viable exchange rate regimes for the long term if the political concensus can be maintained.

The early boards also shed light on the role of institutional restrictions. Viewed against modern boards, such as Bosnia and Herzegovina (chapter 13), early boards operated under comparatively soft formal restrictions. The flexibility does not seem to have been abused, however, and does not appear to have been a matter of much concern. The line of reasoning suggests that the tightness of the legal structure is crucial when other credibility-enhancing mechanisms are lacking, but matters less otherwise. The very similar performance of Lithuania—the softest of the modern boards—and Estonia—the second hardest after Bosnia and Herzegovina—provides a telling modern example we explore further in a later chapter.

Table 2.3
Pre-1990 currency boards

Country	Colony of	Indepen-dence	Years under CBA	Reserve ratio and assets	Anchor currency
Abu Dhabi	UK	1971	1966–1973	100%+ gold and foreign reserves	£
Aden (Yemen)	UK	1967	1951–1972	100%+ £	£
Anguilla	UK		1935–1983	100%+ £ and West Indies	£
Antigua and Barbuda	UK		1935–1983	100%+ £ and West Indies	£
Antigua and Barbuda	UK		1983–present	60% foreign reserves and gold	US$
Argentina			1902–1914	100% gold after 293m pesos	Gold
Argentina			1927–1929	100% gold after 293m pesos	Gold
Bahamas	UK	1973	1916–1974	100%+ £	£ ($ after 1966)
Bahrain	UK	1971	1965–1973	100%+ foreign reserves	£
Barbados	UK	1966	1937–1973	100%+ £	£
Bermuda	UK		1915–present	110%+ £ (1915–1970) 115 $ (1970–present)	£ ($ after 1970)
British Guiana (Guyana)	UK	1966	1937–1965	100%+ £ + 10% guiana	£
British Honduras (Belize)	UK	1981	1894–1981	67% gold, 33% £ and U.S. dollar, 100 £/ dollar after 1939	Dollar
British Solomon Islands	UK	1978	1930s–1940s	100%+ Australian and £	Australian £
British Somaliland (Somalia)	UK	1960	1942–1961	100% £	£
Brunei	UK	1983	1952–1973	110% £, 100% gold and foreign exchange after 1967	
Brunei Darussalam				Liquid foreign assets	Singapore $
Burma	UK	1948	1947–1952	100% £	£
Cameron (Nigeria)	UK	1959	1916–1959	110% £	£

Table 2.3
(continued)

Country	Colony of	Indepen-dence	Years under CBA	Reserve ratio and assets	Anchor currency
Cayman Islands	UK		1933–1961	100% £	Jamaica (£)
Cayman Islands	UK		1972–present	100% U.S. dollar	U.S. dollar
Ceylon (Sri Lanka)	UK	1948	1884–1950	110% £ and rupees, 1917–1950	Indian rupee
Cyprus	UK	1960	1928–1964	110% £	£
Danzig (Gdansk)			1923–1924	100% £	£
Djibouti			1949–present	Foreign assets	US$
Dominica	UK	1970s	1935–1983	110% £ 1951–1964, 70% £ + 30% West Indies $ 1964–1968, 100% £ + some West Indies $ 1968–1971, 100% foreign exchange 1974–1983	Trinidad 1935–1951, £ 1951–1976, US$ 1976–1983
Dominica	UK	1970s	1983–present	60% foreign reserves and gold	US$
Dubai	UK	1971	1966–1973	100% gold and foreign exchange	Gold
Eritrea (Ethiopia)	Italy	1993	1942–1945	100% £	£
Ethiopia			1942–1945	100% £	£
Falkland Islands	UK		1899–present	100%+ £	£
Faeroe Islands (Denmark)			1940–present	100% £ (Danish kroner after 1949)	£ (Danish kroner)
Fiji	UK	1970	1913–1975	100%+ £	£
Gambia	UK	1965	1913–1971	110% £, 100% foreign reserves after 1964	£
Gibraltar	UK		1927–present	100%+ £	£
Gold Coast (Ghana)	UK	1957	1913–1958	110% £	£

Grenada	UK	1970s	1935–1983	110% £ 1951–1964, 70% £ + 30% West Indies $ 1964–1968, 100% £ + some West Indies $ 1968–1971, 100% foreign exchange 1974–1983	Trinidad 1935–1951, £ 1951–1976, US$ 1976–1983
Grenada	UK	1970s	1983–present	60% foreign reserves and gold	US$
Hong Kong	UK		1935–1941	105% £	£
Hong Kong	UK		1945–1974	105% £	£, US$ 1967
Hong Kong (China)	UK		1983–present	105% US$	US$
Iraq	UK	1932	1931–1949	100%+ £	£
Ireland	UK	1921	1928–1943	100% £ after first £6m	£
Italian Somaliland (Somalia)	Italy	1960	1941–1959	100% £ (and foreign exchange, gold after 1950)	£
Jamaica	UK	1962	1933–1961	100% £ (30% Jamaican after 1953)	£
Kenya	UK	1963	1897–1966	100% £	£
Kuwait	UK	1961	1961–1969	50% gold (min), 50% £/US$ (max)	£
Liberia			1961–1969		£
Libya	UK, F	1951	1950–1956	100% £	£
Malaya (Malaysia)	UK	1963	1899–1942	110% £	£
Malaya (Malaysia)	UK	1963	1946–1967	110%	£
Maldives Islands	UK	1965	1849–1967		Linked to Mauritius
Malta	UK	1964	1949–1965	100%+ £	£
Mauritius	UK	1964	1849–1967	33–50% coin, 50–67% Mauritius rupees and £, 110% £ since 1934	Indian rupee, £ since 1934
Montserrat	UK		1935–1983	100+ £ West Indies	£
New Zealand	UK	1907	1850–1856	25% (min) coin, 75% (max) £	£

Table 2.3
(continued)

Country	Colony of	Indepen-dence	Years under CBA	Reserve ratio and assets	Anchor currency
Nigeria	UK	1960	1913–1959	110% £	£
North Borneo (Malaysia)	UK	1963	1881–1942 1946–1967	110% £	Spanish 1$, £ since 1906
North Russia			1918–1920	75% £, 25% rubles	£
Northern Rhodesia (Zambia)	UK	1964	1940–1956	110% £ 1940–1942, 100% £ + 10% Rhodesian £ 1942–1947, min 50% £ + max 60% Rhodesian £ 1947–1956	£
Nyasaland (Malawi)	UK	1966	1940–1956	110% £ 1940–1942, 100% £ + 10% Rhodesian £ 1942–1947, min 50% £ + max 60% Rhodesian £ 1947–1956	£
Oman			1970–1974	100%+ £	£
Palestine	UK		1927–1948	110% £	£
Panama			1904–1931	100% silver coin + 15% US$ = 100% of gold	US$
Philippines	USA	1946	1903–1918	100% silver coin + 15–25% US$ 17.5 US$ + 17.5% Pesos 1908–1918.	US$
Philippines	USA	1946	1923–1942	100% silver coin + 15–25% US$	US$
Philippines	USA	1946	1945–1948	100% silver coin + 15–25% US$	US$
Qatar	UK	1971	1966–1973	100% gold and foreign exchange	Gold
St. Helena	UK		1970s	100%+ £	£
Sarawak (Malaysia)	UK	1963	1927–1942, 1946–1967	110% £	£

Seychelles	UK	1976	1849–1966	100+ £	Linked to Mauritius
Sierra Leone	UK	1961	1913–1964	110% £	£
Singapore	UK	1967	1899–1942, 1946–1973	50–67% coin + 33–50% Indian r and £ (1899–1923), 110% £ 1923–1942, 1946–1967, 100% gold and foreign exchange 1967–1973	
Southern Rhodesia (Zimbabwe)	UK	1965	1940–1956	110% £ 1940–1942, 100% £ + 10% Rhodesian £ 1942–1947, min 50% £ + max 60% Rhodesian £ 1947–1956	
St. Kitts and Nevis	UK		1935–1983	100+ £ West Indies	£
St. Kitts and Nevis	UK		1983–present	60% foreign reserves and gold	US$
St. Lucia	UK	1970s	1935–1983	110% £ 1951–1964, 70% £ + 30% West Indies $ 1964–1968, 100% £ + some West Indies $ 1968–1971, 100 percent foreign exchange 1974–1983	Trinidad 1935–1951, £ 1951–1976, US$ 1976–1983
St. Lucia	UK	1970s	1983–present	60% foreign reserves and gold	US$
St. Vincent Grenadines	UK	1970s	1935–1983	110% £ 1951–1964, 70% £ + 30% West Indies $ 1964–1968, 100% £ + some West Indies $ 1968–1971, 100% foreign exchange 1974–1983	Trinidad 1935–1951, £ 1951–1976, US$ 1976–1983
St. Vincent Grenadines	UK	1970s	1983–present	60% foreign reserves and gold	US$
Sudan	Egypt, UK	1956	1957–1960	50% £ + 50% Sudanese £	£
Swaziland	UK	1968	1974–1986	100% South African Rands	Rand
Tanganyika (Tanzania)	UK	1961	1920–1966	100% £	£

Table 2.3
(continued)

Country	Colony of	Indepen-dence	Years under CBA	Reserve ratio and assets	Anchor currency
Togoland (Ghana)	UK	1957	1914–1958	110% £	£
Tonga	UK	1970	1936–1974	100%+ £ and Australian	Australian £
Transjordan (Jordan)	UK	1946	1927–1964	110 £	£
Trinidad and Tobago	UK	1962	1935–1964	100%+ £	£
Uganda	UK	1962	1919–1966	100% £	£
Western Samoa	NZ	1962	1920–1973	100% New Zealand	£ (1920–1967), NZ 1967–1973
Yemen Arab Republic			1964–1971	100%+ £	£
Zanzibar (Tanzania)	UK	1961	1936–1966	100% £	£

Sources: Schuler 1992 (primary); and authors.

3 Why Do Countries Choose Currency Boards?

3.1 Introduction

When passing the Sirens, Ulysses had himself tied to the mast to avoid succumbing to the temptation. More prosaically, but based on much the same principle, currency boards are meant to restrain the monetary authorities from yielding to the temptation of springing monetary surprises—whether to stimulate output or to erode the real value of government debt. This self-imposed restraint, it is hoped, will anchor inflationary expectations and impart credibility to monetary policies, thus lowering nominal and real interest rates and making disinflation less costly. But tying one's hands comes at a price—the loss of monetary policy to stabilize output or provide liquidity to help stave off financial sector crises. Whether or not to adopt a currency board depends upon how this trade-off plays out in the specific circumstances facing each country.

In this chapter, we lay out some of the theoretical arguments for why countries might—or might not—want to choose a currency board arrangement. Section 3.2 reviews the main features of currency board arrangements, focusing on the differences with other monetary and exchange rate regimes. Section 3.3 discusses the credibility effects generated by these features. Section 3.4 casts the decision to adopt a currency board regime as the outcome of two choices: first, between fixed and floating exchange rates, and, second, between a soft and a hard peg. Section 3.5 concludes.

3.2 Defining Features of Currency Board Arrangements

A currency board is just one of many possible exchange rate regimes ranging from pure floats at one end of the spectrum to the adoption of

a foreign currency as the national tender at the other.[1] Within this spectrum of regimes, currency boards are identified by three defining features. First, the nominal exchange rate is fixed at a given parity against an anchor currency (or possibly an anchor basket) with the domestic money fully convertible into the reserve currency (at least for current transactions). Second, the monetary liabilities of the central bank (and sometimes some fraction of wider monetary aggregates) are subject to a specified foreign exchange backing requirement. Third, CBAs are virtually always codified in law, occasionally even in the constitution, giving rise to very high institutional costs of exiting the board.

These features distinguish currency boards from other exchange rate regimes. Compared to a floating exchange rate regime, the most obvious difference lies in the commitment to keep the nominal parity fixed. Furthermore, a floating exchange rate system specifies the exchange rate regime but does not impose a monetary regime: the central bank can still decide on its monetary policy, be it a rule—such as an interest rate rule, a base money target, or an inflation target—or be it pure discretion. Under a currency board, by contrast, monetary policy is fully subordinated to the exchange rate commitment; by the rules of the regime, monetary growth is largely determined by balance of payments flows.

Currency boards also differ from standard adjustable pegs. While a central bank with a pegged exchange rate will typically hold some foreign exchange reserves, it is generally not legally obliged to do so. Moreover, under a peg, the central bank is not de jure constrained from expanding monetary liabilities through domestic credit expansion, though doing so will affect the likelihood that the peg survives. As adjustable pegs are typically based on central bank policy rather than on national law, the political costs of exiting are generally lower than for currency boards.[2]

While a currency board arrangement represents a "hard" peg, even more extreme commitments are possible, such as the unilateral adoption of a foreign currency as the national tender[3] ("dollarization"[4]). Relative to a currency board, full dollarization imposes additional constraints because an exit through the reintroduction of a national currency is more difficult and because devaluations (which in principle are still possible under a currency board) are by definition ruled out.

3.3 Credibility Effects

A fixed nominal exchange rate, the first feature defining currency boards, provides a highly visible, readily understood and verifiable metric of the value of the currency, an important feature in countries embarking on a disinflation program against a historical background of high inflation, and for newly independent nations that lack a monetary policy track record. Since official price statistics are available with a lag and may at times be at odds with individual subjective perceptions, the visibility and timeliness of exchange rate data provide significant advantages in the battle to break inflationary expectations.[5]

The second feature, the backing of the currency by foreign exchange reserves, guarantees that the central bank is always *able* to honor its monetary liabilities at the parity rate. The assurance this provides may be somewhat illusory, however, as the fact that the consolidated public sector has sufficient reserves to honor its monetary liabilities is no guarantee that the government will choose to use them for that purpose. Furthermore, even if the central bank has more than enough reserves to cover its monetary liabilities, reserves are unlikely to cover all foreign currency denominated public debt as well. A case in point is provided by the Argentine currency board, which collapsed when there was a run on the banking system as it became evident that the government would not be able to honor its foreign currency debt.

The relationship between excess coverage relative to the legal requirement and the credibility of the regime is likely to be complex, and may well be nonmonotonic. Without excess reserves, the authorities retain no room for maneuver and under the rules of the regime[6] a capital outflow necessarily leads to a corresponding decrease of the money supply and tightening of monetary conditions. Excess coverage allows the central bank to conduct (limited) lender of last resort operations as well as some discretionary monetary policy. In the face of capital outflows, for instance, the authorities could sterilize the outflows, insulating the economy from a rise in interest rates and making the repercussions of the regime more palatable.[7] Yet the very discretion that excess reserves coverage affords also means that the automaticity of the policy adjustment mechanism is suspended, potentially undermining credibility if there are concerns that the authorities may abuse their discretion, for instance, by money financing the fiscal deficit.

Box 3.1
Implications of currency boards for fiscal policy

Beyond the effects explored in this chapter, the exchange rate regime is likely to have an impact both on fiscal performance and on the conduct of fiscal policy, though the direction and magnitude of the effects are generally ambiguous, depending on country characteristics.

To the extent that the central bank holds a smaller proportion of its assets in the form of domestic credit under a currency board than it would under a float or a simple peg, the seigniorage that accrues from a given demand for base money is lower. Counteracting this effect, countries adopting currency boards often do so because of a history of high inflation, resulting in severe demonetization of the economy. If the currency board helps to restore confidence in the domestic currency and raises money demand it need not be associated with a decline in seigniorage revenues.[a] Second, a CBA may eliminate or at least reduce the currency risk premium, lowering the government's debt service costs and thus reducing the overall deficit for a given primary balance. The effect will be most pronounced if the average maturity of the debt is short, allowing a rapid replacement of high- by low-interest rate debt. If maturities are long, by contrast, the short-run impact is likely to work in the opposite direction through higher ex post real interest rates.

Beyond fiscal performance, the exchange rate regime may affect fiscal discipline and the conduct of fiscal policy. A first effect operates through the rule itself: a currency board arrangement circumscribes—or outright prohibits—money financing of the fiscal deficit. To the extent that there is a political cost of abandoning the peg or violating the rules, a currency board should promote fiscal discipline. Even if the central bank does not money finance the deficit and the government is able to issue bonds, a fixed exchange rate regime can imply a constraint on fiscal policy. From the public sector's intertemporal budget constraint, the present discounted value of real primary surpluses (plus seigniorage revenues) must equal the outstanding nominal stock of base money plus government bonds deflated by the domestic price level. Assuming sticky prices and purchasing power parity—or at least a limit to how far domestic prices can deviate from foreign prices without taking a toll on competitiveness—satisfying the public sector's budget constraint requires either a "fiscal dominant" or a "money dominant" regime.[b] In a fiscal dominant regime, the path of primary surpluses is given, and the exchange rate adjusts to ensure equality of the real value of outstanding liabilities to the present value of primary surpluses. In a money dominant regime, the nominal exchange rate is given, and it is the present value of primary surpluses that must adjust. While a viable fixed exchange rate regime requires a money dominant regime, it is an open question whether a hard peg is more likely to *bring about* a true money dominant regime.

Box 3.1
(continued)

On one hand, the cost of exiting a currency board arrangement should raise the likelihood of a money dominant regime with the entailed fiscal discipline.[c] On the other hand, as Tornell and Velasco (1995, 2000) note, since the exchange rate peg—for as long as it lasts—helps keep inflation low, it can also allow the government to "cheat," apparently delivering sound macroeconomic policies while running unsustainable fiscal deficits that eventually burst into open inflation when the peg collapses. While the argument may have some merit in the case of money-financed deficits, it is less compelling for bond financing as the unsustainable policy would immediately be reflected in a growing public debt rather inflation under either exchange rate regime.[d]

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[a] By contrast full dollarization must be associated with a loss of seignorage because all of the seignorage accrues to the anchor country, regardless of the behavior of money demand.

[b] The public sector's intertemporal budget constraint may be written

$$\frac{D_{t-1}+M_{t-1}}{P_t}=\left\{\sum_{j=0}^{\infty}\frac{(R_{t+j}-E_{t+j}+\theta_{t+j})}{(1+r)^j}\right\},$$

where D_{t-1} is the nominal stock of government debt and M_{t-1} is the nominal stock of money (net of the central bank's foreign exchange reserves and credit to the economy) outstanding at the beginning of period t, P is the price level, $R_{t+j}-E_{t+j}$ is the primary surplus, and θ is central bank seigniorage (in real terms), $(1+r)$ is the economy's discount factor. An inconsistency arises if the expected path of primary surplus violates the intertemporal budget constraint. In that case, either the government must default on some of its debt, or the price level must jump. But an increase in the price level will, in general, be inconsistent with a pegged exchange rate regime, leading to an overvaluation of the exchange rate, a loss of competitiveness, and eventually a collapse of the peg.

[c] A further consideration stems from the stabilization role of macroeconomic policies. Since monetary policy is constrained under a currency board, the burden of output stabilization falls primarily on fiscal policy (albeit not necessarily with much success; see Fátas and Mihov 2003). If a high level of public debt would impose a constraint on further financing of the fiscal deficit, then prudence dictates that countries with hard pegs should, on average, maintain low levels of public debt in order to have at least one policy instrument available in the event of an economic downturn.

[d] Nevertheless, hard pegs may encourage excessive foreign-currency-denominated lending to the government by disguising the true external debt ratio through an artificially high real exchange rate.

The political and economic costs of abandoning the regime is the third element that should enhance credibility. As Barro and Gordon (1983b) argue, in the presence of some price or wage stickiness, central banks promising low monetary growth have an incentive to renege and generate surprise inflation (to lower real wages and raise employment). As the private sector adjusts to this incentive, the inability of the central bank to credibly commit to low monetary growth imparts an inflationary bias to the economy.

As we show in section 3.4, in an open economy an exchange rate commitment can provide a solution to the central bank's time inconsistency problem, as long as sufficient political (reputational) or economic penalties exist for breaking the exchange rate peg.[8] Of course, the monetary authorities would also suffer reputational costs for breaking other monetary policy commitments, such as a money or an inflation target. The attraction of a hard peg must therefore rest on a comparatively higher cost of violating this particular commitment. At first sight, it is not clear why this should be the case. Indeed, if the main concern is that the central bank may generate inflationary surprises, an inflation-targeting framework would seem to be the most natural and effective commitment device. Herrendorf (1997) suggests one reason why a peg may be preferable: the exchange rate parity, being under more direct control of the authorities than the inflation rate, is a more telling indicator of the policy commitment because any deviation is immediately revealed as a deliberate policy action rather than a stochastic shock. Moreover, inasmuch as the exchange rate peg (a fortiori, a currency board arrangement) encourages foreign currency denominated borrowing (both domestic and external), a credible commitment is self-enhancing as the very adherence to the regime raises the economic disruption of exiting, making policy makers all the more wary of pursuing policies that could undermine the peg.[9]

In sum, each of the elements defining a currency board serves to enhance policy credibility. In the following sections, we delve deeper into the costs and benefits of that credibility gain.

3.4 Insulation, Integration, and Credibility

Adopting a currency board arrangement can be thought of as two distinct decisions: first, the choice of a fixed over a floating exchange rate regime, and, second, within the spectrum of pegged exchange rate regimes, the selection of a hard peg in preference to a traditional

"softer" peg. In this section, we cast the decision to adopt a currency board in terms of these two choices, beginning with a review of the relative merits of fixed versus floating exchange rates before turning to the trade-off between the credibility gain provided by a hard peg and the easier escape in the face of shocks allowed by softer pegs.

3.4.1 Fixed versus Floating Exchange Rates

The choice between a floating and a fixed exchange rate ultimately comes down to the trade-off between the benefits of reducing exchange rate volatility and the costs of foregoing an independent monetary policy. The vast literature exploring this trade-off identifies three central criteria for making this choice: the effect of the regime on the insulation of the economy from real and nominal shocks; its effect on the degree of integration with partner countries; and its role in enhancing policy credibility to help disinflate and maintain low inflation. We discuss each in turn.

3.4.1.1 Insulation Properties The early postwar consensus on pegged rates began to crumble in the face of the repeated balance of payments crises during the 1960s, prompting a number of economists to revive Friedman's (1953) case for exchange rate flexibility as adjustment tool in the face of balance of payments problems. This academic debate, however, found little resonance in official circles, where the prevalent view was that abandoning the Bretton Woods system of fixed but adjustable parities risked a return to the interwar chaos of competitive devaluations and beggar-thy-neighbor policies.

In the event, neither view turned out to be quite right. While floating exchange rates among the major industrialized countries appeared to be driven more by capital flows than by underlying trade imbalances—rendering them less useful for orderly adjustment than their proponents had claimed—most countries also seemed to cope reasonably well with the higher volatility of nominal and real exchange rates—contradicting the warnings of fixed exchange rate advocates.

A large body of literature spurred by the influential papers of Fleming (1962) and Mundell (1962, 1963) advanced the understanding of the insulating properties of fixed and floating regimes for national income and output. While the original models concerned the efficacy of activist macroeconomic policies under alternative regimes,[10] they could also—by reinterpreting policies as shocks—be used to evaluate the passive stabilization properties of regimes. Used in this manner,

the models implied that under conditions of high capital mobility fixed exchange rates provide better insulation against nominal shocks while floating exchange rates provide some insulation against the effects of real shocks.[11]

3.4.1.2 Fostering Real Integration The postwar European agenda of greater regional integration shed a different light on the debate over exchange rate regime choice, exploring two core questions. Do fixed exchange rates foster cross-border trade and investment? If so, are there criteria defining whether a given group of countries should go a step further and adopt a common currency?

Empirical evidence on the first question has yielded mixed results. Among industrialized countries, exchange rate volatility per se does not appear to be a major impediment to international trade or investment, perhaps reflecting hedging options.[12] Yet, there is also some evidence that monetary unions (or unilateral "dollarization") may be associated with substantially higher bilateral trade.[13]

Reflecting the long-term goal of European monetary unification, the second question attracted substantial theoretical and empirical attention in the optimum currency area (OCA) literature. The basic point made by Mundell (1961) is straightforward. Since adopting a fixed exchange rate involves surrendering the nominal exchange rate as an adjustment tool, the case for pegging between two countries (or of adopting a common currency) is strongest if the two countries would seldom have a need to alter their bilateral exchange rate because they are subject to shocks that are similar in size and highly correlated; and if alternative adjustment mechanisms—wage and price flexibility, factor mobility, and fiscal transfer systems—are available.

3.4.1.3 Credible Disinflation The collapse of Bretton Woods and the first oil price shock largely relegated European monetary unification to the backstage. By the time the European countries were again reestablishing semifixed exchange rates within the "snake," and, later, the European Monetary System (EMS), the main policy concern had shifted to combating inflation. In this new context, pegging the exchange rate (directly or indirectly to the deutsche mark) was seen as a precommitment device, helping to lower inflation expectations and thus to achieve durable reductions in inflation by, in effect, importing the Bundesbank's credibility.

For the modern currency boards introduced in the 1990s, the insulation and integration properties remain important. But the core motivation has generally been a desire to rapidly (re)establish policy credibility.[14] In what follows, we present a more formal model (based on Ghosh, Gulde, and Wolf 2003 in turn drawing on Cukierman 1992) to illustrate the considerations and trade-offs arising in this endeavor. The model illustrates both the insulating properties of fixed and floating exchange rates and the credibility effect of pegging. We then extend the model (in section 3.4.2.1) to consider the choice among a float, a soft peg, and a hard peg such as a currency board.

3.4.1.4 A Formal Model of Fixed versus Floating Exchange Rates

The analytical structure is an open economy variant of the policy credibility model considered by Barro and Gordon (1983a, b). Output is determined by a Lucas-type supply function:

$$y = \theta(\pi - \pi^e) + \eta, \tag{1}$$

where y is the log of output, π is the inflation rate, π^e is the private sector's expectation of the inflation rate, and θ is a positive constant. Output is subject to a random productivity shock, η, with mean zero and variance σ_η^2, observed after the private sector sets wages but before the central bank decides on monetary policy.[15] The natural level of output is normalized to zero. Workers demand nominal wage increases sufficient to cover expected inflation. Employment is determined by realized real wages. If inflation turns out to be unexpectedly high, real wages are eroded, making it profitable for firms to increase employment and output.

The inflation rate is determined by the rate of money growth and a monetary shock:

$$\pi = \Delta m + \upsilon\pi^e + \varepsilon, \tag{2}$$

where ε has mean zero, has variance σ_ε^2, and is uncorrelated with η, and where υ is the elasticity of the growth of velocity with respect to expected inflation, reflecting forward-looking elements in household money demand. For simplicity, the banking system is ignored, so that the money supply consists of central bank domestic credit and international reserves: $\Delta m = \Delta dc + \Delta r$.[16] Under fixed exchange rates, the central bank chooses Δdc while the change in reserves is endogenous; under floating rates, the central bank again chooses Δdc but does not

hold reserves (so $\Delta r = 0$), while the nominal exchange rate is endogenous. The model is closed by purchasing power parity:

$$\pi = \pi^* + \Delta e, \tag{3}$$

where π^* is the partner country inflation rate, which is assumed to be lower than the domestic inflation rate, and is set to zero for simplicity (this also means, however, that volatility from the anchor currency is ignored).[17]

The central bank is assumed to have two objectives: stabilizing output around some desired level, $\bar{y} > 0$, and keeping inflation low. The objective function may therefore be written as follows:

$$Min\ L = \frac{1}{2} E\{A(y - \bar{y})^2 + \pi^2\}, \tag{4}$$

where $E\{\cdot\}$ is the central bank's expectation and A denotes the relative weight placed on output. More generally, A can be interpreted as the marginal benefit from surprise inflation from any source. The assumption that $\bar{y} > 0$ means that the central bank is aiming for a level of output above the economy's natural level. In the original Barro-Gordon setup, it is assumed that unionization of the labor force leads to a socially suboptimal level of employment. Thus the central bank is tempted to generate surprise inflation in order to erode real wages and thereby raise employment and output. Alternatively, as emphasized by Cukierman (1992), the term could reflect an incentive to erode the real value of nominal debt, in which case π^e would represent the expectations of bondholders. Although central bank independence is not formally modeled here, the parameters A and $\bar{y}$ together capture the central bank's inflationary proclivity, which may be related to its independence. In particular, a central bank that is not very independent may be tempted—or forced—to tolerate a higher inflation rate in order to boost employment (or erode the public debt); as shown later, when the central bank has monetary discretion, the inflation rate is directly proportional to these parameters. This also suggests that independence of the central bank—and a "conservative" central banker—provide alternative monetary commitment devices (de Haan, Berger, and van Fraassen 2001).[18]

Fixed Exchange Rate Regime The solution under a (credible) fixed exchange rate is straightforward. The purchasing power parity condition

(3) implies that with a fixed exchange rate, domestic inflation equals foreign inflation:

$$\pi = \pi^* = 0. \tag{5}$$

Since monetary policy can affect neither inflation nor the level of output, the central bank has no incentive to expand the money supply; hence domestic credit is constant and the expected inflation rate under rational expectations is zero:

$$\pi^e = E\{\pi\} = 0. \tag{6}$$

Monetary shocks, ε, are passively absorbed by the change in reserves, $\Delta r = -\varepsilon$. The absence of an activist monetary policy, however, implies that the productivity shock to output cannot be offset:

$$y = \eta. \tag{7}$$

Substituting (7) and (6) into (4) and taking expectations yields the central bank's expected loss under the fixed exchange rate regime:

$$L^{Fix} = \frac{1}{2}\{A(\sigma_\eta^2 + \bar{y}^2)\}. \tag{8}$$

For future reference, it is also useful to calculate the central bank's loss for a given realization of the productivity shock:

$$L^{Fix}(\eta) = \frac{1}{2}\{A(\eta - \bar{y})^2 + 0\} = \frac{1}{2}\{A(\eta^2 - 2\eta\bar{y} + \bar{y}^2)\}. \tag{9}$$

Floating Exchange Rate Regime Under a regime of floating exchange rates, reserves are constant and the central bank is free to pursue an activist monetary policy that minimizes the loss function (4):

$$\Delta dc = \frac{-A\theta\eta + A\theta y + A\theta^2(1-v)\pi^e - v\pi^e}{1 + A\theta^2}. \tag{10}$$

Substituting (10) into (2) yields a semireduced form for inflation:

$$\pi = \frac{-A\theta\eta + A\theta\bar{y} + A\theta^2\pi^e}{1 + A\theta^2} + \varepsilon. \tag{11}$$

Actual inflation is increasing in the central bank's incentive to create surprise inflation, $A\bar{y} > 0$, and in the private sector's expectation of

inflation, π^e. Under rational expectations, the latter is given by the mathematical expectation of actual inflation:

$$\pi^e = A\theta\bar{y} > 0. \tag{12}$$

In particular, this implies that the central bank cannot systematically surprise the private sector. This is evident from the reduced form for output, which is independent of $\bar{y}$:

$$y = \theta(\pi - \pi^e) + \eta = \frac{\eta}{1 + A\theta^2} + \theta\varepsilon. \tag{13}$$

The expected welfare loss under the floating regime is

$$L^{Flt} = \frac{1}{2}\left\{(1 + A\theta^2)\left(\frac{A\sigma_\eta^2}{(1 + A\theta^2)^2} + \sigma_\varepsilon^2 + A\bar{y}^2\right)\right\}. \tag{14}$$

Again, for future reference, it is also useful to calculate the welfare loss for a given realization of the productivity shock (for this purpose, the monetary shock is ignored):

$$L^{Flt}(\eta) = \frac{1}{2}\left\{\frac{A\eta^2}{1 + A\theta^2} - 2A\eta\bar{y} + A\bar{y}^2(1 + A\theta^2)\right\}. \tag{15}$$

Comparison of Regimes The central bank will choose a floating exchange rate regime when the expected loss (14) is lower than the expected loss under the fixed exchange rate regime (8). It is useful to start with some special cases. If $\bar{y} = 0$, the central bank does not wish to create surprise inflation; the choice of regimes consequently reduces to the traditional Mundell-Fleming criterion. Specifically, the model implies that

$$L^{Fix} > L^{Flt} \quad \textit{iff} \quad A\sigma_\eta^2 > \frac{A\sigma_\eta^2}{1 + A\theta^2} + (1 + A\theta^2)\sigma_\varepsilon^2. \tag{16}$$

If the economy is exposed to productivity shocks but not to monetary disturbances ($\sigma_\varepsilon^2 = 0$), then the expected loss under the fixed exchange rate regime is larger than the expected loss under the floating regime. Conversely, if the economy is exposed to monetary but not to productivity shocks, then the fixed exchange rate is superior. Absent time-inconsistency problems, the model thus confirms the core Mundell-Fleming result that a floating regime better insulates output

against real shocks as the exchange rate adjusts, while a fixed exchange rate insulates output against monetary shocks, which are absorbed by movements in the central bank's foreign exchange reserves.

It is also instructive to consider the case of a nonstochastic economy in order to isolate the effects of policy credibility problems. Setting both $\sigma_\varepsilon^2 = 0$ and $\sigma_\eta^2 = 0$, and assuming that $\bar{y} > 0$ (so the central bank has an incentive to generate surprise inflation), it is apparent from (6) and (12) that inflation is lower under the fixed exchange rate regime. This result reflects both a "discipline" effect, operating through lower money growth (under the peg, $\Delta m_{peg} = 0$, while under the float, $\Delta m_{Flt} = (1 - v)A\theta\bar{y} > 0$) and a "confidence" or "credibility" effect working through inflationary expectations (expected inflation is zero under the peg but positive under the float, $\pi^e_{flt} = A\theta\bar{y} > 0$). The confidence effect is reflected in a higher growth of money demand (a faster rate of monetization of the economy or a faster decline in velocity), implying, from (2), lower inflation for a *given* rate of money growth. Although inflation is lower under the fixed exchange rate, the level of output is the same under the two regimes because it is not possible to systematically fool wage setters, $\pi^e = E\{\pi\}$. It follows that the welfare loss is lower under the fixed exchange rate regime:

$$L^{Peg} = A\bar{y}^2 < (1 + A\theta^2)A\bar{y}^2 = L^{Flt}.$$

Using the exchange rate as a nominal anchor thus provides a precommitment device, which allows the central bank to avoid the welfare cost associated with the central bank's inability to commit to low inflation. Drawing these cases together, we observe that in general a floating regime is better when the economy is subject to large real shocks; a fixed exchange rate is preferable when either monetary shocks or policy credibility problems dominate.

The Exit Incentive Last but not least, it is worth noting that *if* the private sector expects that the fixed exchange rate regime will be maintained, the central bank has an incentive to renege on its promise and to undertake a surprise devaluation cum inflation:[19]

$$G = L^{Peg}(\eta) - L^{Flt}_{(\pi^e=0)}(\eta) = A(\eta - \bar{y})^2 - \left\{\frac{A(\eta - \bar{y})^2}{(1 + A\theta^2)}\right\}$$

$$= \frac{A^2\theta^2(\eta - \bar{y})^2}{(1 + A\theta^2)}, \tag{17}$$

with the temptation increasing the size of a (negative) productivity shock. For the fixed exchange rate regime to be sustainable therefore requires some extraneous penalty such as a political cost for reneging on the exchange rate commitment, a point further explored in this chapter.

3.4.2 Soft versus Hard Pegs

The previous section explored the choice between a fixed and a floating exchange rate. Conditional on choosing a fixed exchange rate, authorities must then choose between an adjustable soft peg and a hard peg such as a currency board arrangement or unilateral dollarization. Here we turn to this second decision. Some of the relevant considerations have been alluded to earlier: under a simple peg, seigniorage tends to be larger because the central bank would typically earn a higher return on its domestic assets than on foreign exchange reserves; at the other extreme, the central bank earns nothing under full dollarization.[20]

Another consideration is the ability of the central bank to act as lender of last resort to the domestic banking system. Again, there is a spectrum of possibilities. Under full dollarization, the domestic central bank has no ability to act as a LOLR (unless it has a positive net foreign asset position), though the government can always extend credit from its own deposits or by borrowing if it is able to do so. Under a currency board regime, the ability to provide liquidity depends on the availability of excess foreign exchange coverage. Bulgaria's currency board arrangement, for instance, incorporates an explicit "Banking Department" whereby the central bank can extend at least a limited amount of domestic credit to the banking system without violating the currency board rules (see chapter 12).[21] While the scope for LOLR operations is greater under a simple peg because extending domestic credit is not prohibited by the rules of the regime, it is not unlimited; eventually, the extension of unsterilized liquidity support by the central bank will lead to a loss of foreign exchange reserves and a collapse of the peg.[22]

Beyond the implications for seigniorage and LOLR functions, the most crucial distinction between soft and hard pegs is the cost of exiting the regime. As we discuss in chapter 4, currency boards are generally marketed as more permanent regimes compared to traditional pegs, with their rules often imbedded in law or even in the constitu-

tion. An exit from a currency board is thus likely to carry substantially higher political costs than abandoning a simple peg.

While exchange rate regimes are generally chosen for the long term, there are circumstances under which the central bank might want to adjust or abandon the exchange rate peg. Indeed, if the primary purpose of pegging the exchange rate was to assist in a disinflation program, then the central bank may wish to abandon the peg once inflation has been lowered and credibility established, especially if the country is subject to large real shocks.[23] Even when concerns about credibility remain, however, a sufficiently large shock (or loss of competitiveness) might tip the cost-benefit calculus toward exiting the regime and allowing the exchange rate to adjust. In choosing the regime, the central bank must trade off the credibility benefit of adopting a regime with a very high cost of exit (a hard peg) against the need for flexibility in the face of real shocks (a float), with an adjustable peg providing the middle course between these two extremes.

The optimal degree of exit flexibility is difficult to determine. As Obstfeld (1991) emphasizes, the endogenous response of the private sector is crucial. In particular, while an adjustable peg provides a middle course (trading off credibility with an escape option in the event of a large shock), the very existence of this possibility lowers welfare under the pegged exchange rate regime as long as the peg lasts. This is because the private sector expects (with some probability) a devaluation and inflation that, until it is fulfilled and the peg is abandoned, implies higher ex post real wages and real interest rates (thus depressing economic activity) than without the exit clause. If this effect is sufficiently important, the cost-benefit calculus supports the "bipolar view" (Fischer 2001a): when real shocks are important, the exchange rate should be allowed to float; when credibility problems are important, the central bank should adopt a currency board arrangement —but intermediate regimes such as adjustable pegs are never optimal. We now return to the formal model to explore these trade-offs explicitly.

3.4.2.1 The Extended Model: Float, Soft Peg, or Hard Peg As shown earlier, in the face of negative productivity shocks, the central bank has an incentive to abandon the fixed exchange rate and generate a surprise devaluation cum inflation to stimulate activity. Trivially, the higher the cost of exit, the lower the likelihood that an adverse

productivity shock would make it worthwhile for the central bank to abandon the peg. For given country characteristics, determining the optimal *cost* of exit—that is, the choice among a float, a soft peg, and a hard peg—is thus isomorphic to choosing the regime with the optimal *probability* that the peg is maintained. In what follows, therefore, we consider how the optimal choice of regime, as reflected in the optimal probability that the peg is maintained, ρ^*, depends on structural characteristics of the economy and the credibility problem facing the policymakers. A very low (zero) value of ρ^* suggests that the country should adopt a pure float, a high value suggests a hard peg, while an intermediate value corresponds to a soft peg (i.e., a peg that is readily abandoned).

With a positive likelihood of exit, the expected inflation rate is a probability-weighted average of the inflation rates under the pegged and floating regimes:[24]

$$\pi^e = \rho \times 0 + (1-\rho)\left(\frac{-A\theta\eta + A\theta\bar{y} + A\theta^2\pi^e}{1+A\theta^2} + \varepsilon\right). \tag{18}$$

Solving for expected inflation gives

$$\pi^e = \frac{(1-\rho)A\theta\bar{y}}{1+\rho A\theta^2}. \tag{19}$$

For a given expected inflation rate by the private sector, we now consider what happens if the peg is maintained and if it is abandoned.

Case I: The Peg Is Maintained If the exchange rate peg is maintained, $\pi = 0$. Substituting into (1) gives

$$y = -\frac{(1-\rho)A\theta^2\bar{y}}{1+\rho A\theta^2} + \eta; \quad y - \bar{y} = \frac{-(1+A\theta^2)\bar{y}}{1+\rho A\theta^2} + \eta. \tag{20}$$

Therefore:

$$L^{Peg}(\rho) = \frac{1}{2}\left\{\frac{A(1+A\theta^2)^2\bar{y}^2}{(1+\rho A\theta^2)^2} + A\sigma_\eta^2\right\}. \tag{21}$$

There are two noteworthy aspects of (21). First, when there is no possibility of exit ($\rho = 1$), (21) collapses back to (8), the pure fixed exchange rate case. Second, the welfare loss is decreasing in the probability that the peg is maintained:

$$L_{\rho}^{Peg} = \frac{-A^2\theta^2(1+A\theta^2)^2\bar{y}^2}{(1+\rho A\theta^2)^3} < 0. \tag{22}$$

The intuition is simple: from (19), the higher the probability of exit, the higher the expected inflation. But as long as the peg is maintained, actual inflation is lower than expected inflation, depressing output. Welfare under the pegged regime will hence be a decreasing function of the probability of exit.

Case II: The Peg Is Abandoned If the peg is abandoned and the exchange rate floats, the central bank's optimal policy is given by substituting (19) into (11):

$$\pi = \frac{-A\theta\eta}{1+A\theta^2} + \frac{A\theta\bar{y}}{1+\rho A\theta^2} + \varepsilon, \tag{23}$$

$$y - \bar{y} = \theta(\pi - \pi^e) + \eta = \frac{\eta}{1+A\theta^2} - \frac{\bar{y}}{1+\rho A\theta^2} + \theta\varepsilon, \tag{24}$$

$$L^{Flt}(\rho) = (1+A\theta^2)\left\{\frac{A\sigma_\eta^2}{(1+A\theta^2)^2} + \frac{A\bar{y}^2}{(1+\rho A\theta^2)^2} + \sigma_\varepsilon^2\right\}. \tag{25}$$

When the probability of an exit is unity ($\rho = 0$), we are back to the case of a pure float, and (25) collapses to (14). Differentiating (25) with respect to ρ yields

$$L_{\rho}^{Flt} = \frac{-A^2\theta^2(1+A\theta^2)\bar{y}^2}{(1+\rho A\theta^2)^3} < 0. \tag{26}$$

Again, the expected loss is decreasing in the probability that the peg is maintained, albeit for different reasons than in case I. Here, the higher expected inflation (when there is a high probability that the peg is abandoned) implies higher actual inflation, given the policy response function (11). Although—in contrast to the pure float considered earlier, (13)—the higher inflation stimulates output (since it is not perfectly anticipated), on net, it generates welfare losses for the central bank because of the usual Barro-Gordon time-inconsistency problem.

Optimal Cost of Exit With these preliminaries, it is possible to consider the optimal probability (and hence cost) of exiting the exchange rate regime. The central bank's expected loss is given by

$$L = \rho L^{Peg}(\rho) + (1-\rho)L^{Flt}(\rho). \tag{27}$$

Minimizing with respect to ρ yields the first-order condition for the optimum:

$$\partial L/\partial \rho = Z(\rho) = L^{Peg} + \rho L_{\rho}^{Peg} - L^{Flt} + (1-\rho)L_{\rho}^{Flt} = 0. \tag{28}$$

Three possibilities exist in the optimization problem (27): a corner solution at $\rho^* = 0$, in which case the country adopts a free float; a corner solution at $\rho^* = 1$, in which case the country adopts a hard peg, such as full dollarization or a currency board arrangement; and an interior solution at $0 < \rho^* < 1$, in which case the country should adopt a traditional peg.

Under the bipolar view, countries should adopt either a pure float or a very hard peg—the corner solutions of (28). Under what conditions would an intermediate regime, such as an adjustable peg be optimal? For a soft peg to be optimal, the polynomial $Z(\rho)$ must have a solution $Z(\rho^*)$ $0 < \rho^* < 1$; heuristically, this requires that $Z(0) < 0$ and $Z(1) > 0$, which implies[25]

$$\frac{A^2\theta^2\bar{y}^2}{1+A\theta^2} + \sigma_{\varepsilon}^2 < \frac{A^2\theta^2\sigma_{\eta}^2}{1+A\theta^2} < (1+A\theta^2)\sigma_{\varepsilon}^2 + A^2\theta^2(1+A\theta^2)^2\bar{y}^2. \tag{29}$$

The first part of the condition implies that unless the real shocks to the economy are sufficiently large relative to either the monetary shocks or the policy credibility problem, a hard peg (with little scope for exit) is optimal. The second part of the condition indicates that if real shocks are too large (again in relation to the monetary shocks or the policy credibility problem), the country will be constantly exiting the peg and should simply adopt a float instead. When either part of the condition is violated, the optimal regime for the country is one of the extremes of the bipolar view—either a hard peg or a pure float (figure 3.1).

3.5 Conclusions

Currency boards are distinguished from other regimes by three joint features—a fixed exchange rate, reserve coverage of monetary liabilities (with at least current account convertibility), and a high political cost of exit. The first two features separate currency boards from float-

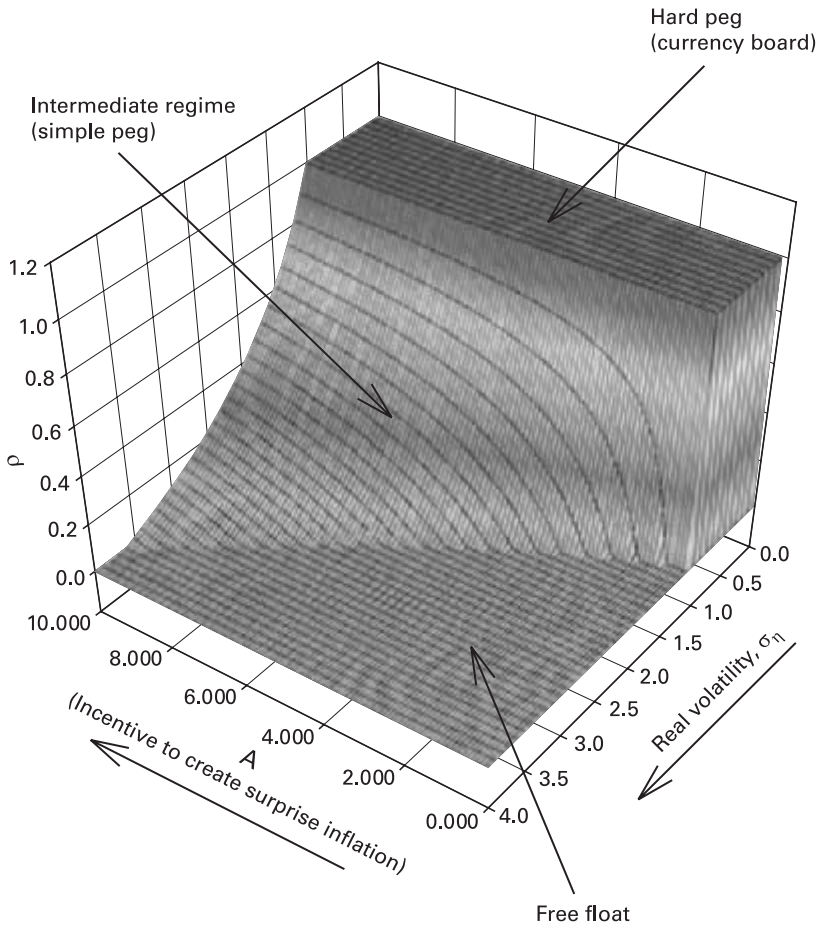

Figure 3.1
Optimal probability of maintaining the peg

ing rates, while the latter two distinguish them from traditional pegs. It is therefore useful to think of the decision to adopt a currency board as consisting of two steps: a first-stage decision between a fixed and a floating exchange rate regime, and a second-stage decision between a soft and a hard peg. In this chapter we have explored the considerations entering both stages.

A fixed exchange rate brings credibility to monetary policy at the cost of losing monetary autonomy. A hard peg further enhances

the credibility of the regime at the cost of closing an easy escape route in the event of large adverse real shocks. In addition, the exchange rate regime has ancillary implications for seigniorage revenues and the conduct of fiscal policy.

How these trade-offs among inflation, output growth, and volatility are manifested in practice is an empirical question to which we turn next.

4 Modern Currency Boards: Structural and Institutional Aspects

4.1 Introduction

The theoretical model developed in chapter 3 demonstrated how the defining characteristics of currency boards combine to lend credibility to monetary policies and facilitate disinflation. The simple conceptual specification sidesteps many of the practical choices facing countries introducing currency boards. These decisions, ranging from the anchor currency, to the monetary aggregate against which the coverage ratio is defined, to the legal status of the board, are far from trivial because they may have significant impact on the credibility of the board. In this chapter we examine some of the practical decisions and trade-offs that must be confronted in designing a currency board arrangement—and how those choices have been resolved in particular instances.[1] In some cases, countries have sought to address monetary policy credibility problems with exchange rate regimes that—while similar to currency boards—do not meet all the conditions of a formal CBA; some examples are considered in box 4.1.

4.2 Conceptual Issues in the Design of a Currency Board

4.2.1 Institutional Framework

Should the board be embedded into a central bank or created as a stand-alone entity replacing the central bank, with other central banking functions delegated to separate institutions? As Ho (2002) notes, while the early boards were replaced outright by active central banks, the revival of currency boards in the 1990s did not lead to a corresponding demise of central banks. Rather, modern currency boards have typically been introduced by creating an "issue department" within the central bank framework. In this embedded model, the issue

Box 4.1
Near currency boards

A number of countries operate monetary arrangements fulfilling some but not all requirements of a currency board and are thus not included in the sample. These include

• *CFA countries* The CFA franc group in Africa includes fourteen member countries.[a] The currency, the CFA franc, was previously pegged to the French Franc and is now tied to the euro. The statutes of the CFA require a 20 percent reserve coverage requirement; 50 percent of the zones' reserve holdings are held in an operations account with the French Treasury. The CFA countries benefit from a convertibility guarantee from the French Treasury. While sharing some features of a currency board, we exclude the CFA countries based on the low coverage requirement.

• *Dollarized countries*[b] A small but growing number of countries operate on a foreign-issued currency as a sole or shared legal tender, including long-standing arrangements, such as Panama. Recent examples include El Salvador, Kosovo, and East Timor. Dollarization is generally viewed as a harder regime than CBAs reflecting the higher costs of violating the rule (reintroducing a domestic currency).

• *Members of asymmetric monetary unions* In a number of monetary unions smaller members peg their currency to a larger member country, with the intention to conduct monetary policy geared towards maintaining the peg. Examples include the Common Monetary Arrangement (CMA) in southern Africa, under which the currencies of Namibia, Swaziland, and Lesotho are tied to the South African Rand, and the fixed exchange rate regimes tying the currencies of Bhutan and Nepal to the Indian rupee. While these regimes all have high de facto reserve coverage, the constraints arise from the practical economic dependence on the anchor currency countries rather than from legal constraints.

A subset of modern currency boards exist in dependent territories, including the Falkland Islands, St. Helena (Hanke and Sekerke 2003), the Faeroe Islands, the Cayman Islands, and Macao (Pau 2003). Due to the absence of comparable data, these CBAs could not be included in the dataset used for the cross-section regressions.

[a] The CFA franc is issued by two separate central banks, the West African Central Bank (BCEAO) which has Côte d'Ivoire, Senegal, Benin, Burkina Faso, Mali, Togo, Niger, and Guinea-Bissau as members and the Central African Central Bank (BEAC) whose members include Cameroon, Gabon, Chad, Republic of Congo, Equatorial Guinea and the Central African Republic. Both zones have virtually the same setup and agreements with France. France has also a seat on the Board of each of the two central banks.

[b] The term "dollarized" is used as a general term, and can refer to currencies other than the U.S. dollar.

department is implicitly or explicitly insulated from the other parts of the central bank that retain their previous central banking functions (including responsibility for the settlement systems, short-term liquidity management, and maintenance of the government's bank accounts) as long as their activities in these areas do not conflict with the monetary rule.

Less frequently, responsibilities for banking supervision and public debt management are also retained in the modified central bank. In these instances, the potential for conflicts of objectives between the issue department and banking supervision in times of crisis places particular importance on the strict insulation of the issue department. Even with such separation, the fundamental conflict between a scope for lender of last resort operations to aid banking system stabilization and the hard rules imposed by the currency board to achieve credibility remains. Historical experience suggests that when faced with the choice between banking system and exchange rate stability, governments have a revealed preference for the former—though there are exceptions such as Estonia. To the extent this choice is anticipated by the markets, the very restrictions on everyday monetary policy aimed at enhancing credibility may also reduce credibility during episodes of financial pressures.

The quandary can be addressed by reducing the likelihood of a financial crisis through improved regulation and supervision of the financial sector, and by instituting alternative lender of last resort arrangements. For example, in the mid-1990s, Argentina negotiated private lines of credit to help provide liquidity support in case of deposit withdrawals from the banking system (though by the time of the 2001 crisis, these were largely extinct). Alternatively, excess reserves can be explicitly set aside within the banking department to help solvent, but illiquid, banks, as was done in Bulgaria. In this setting, firewalls between the issue and banking departments, as well as regular reporting and external auditing obligations, are necessary to safeguard the integrity of the issue department.

Beyond the institutional setup, the selection mechanism for management and supervisory authority of the currency board may influence its credibility. To assuage concerns about political influence of the current government, long, nonrenewable, staggered terms of governors, the delegation of the nomination of some governors to nongovernmental bodies with an interest in stability, and, as was done in Bosnia and Herzegovina, the appointment of foreign governors viewed as

politically neutral are options.[2] Some of the early currency boards, located in London and staffed by British officials, provide a historical example for a management and supervisory personnel structure far removed from the day-to-day politics of the areas covered by the currency board arrangement.

A third institutional choice concerns the legal status of the CBA. A number of countries have opted to enhance transparency and credibility by promulgating a specific CBA law spelling out the rules of the game and the prohibited actions.[3] Basing the board in law rather than proclamation raises the political costs of exiting the regime in the future. Embedding the system in the constitution or requiring supermajorities for its abolition moves further in this direction by assuring that the arrangements will only be changed or materially altered with broad societal or at least political support. Such moves, of course, come at the expense of reduced flexibility in times of crisis. In principle, the tension can be reduced by prespecifying externally verifiable exit conditions, though this route—presumably coming at the cost of reduced credibility—has proven unpopular.

4.2.2 Decisions and Trade-Offs in Currency Board Design

Beyond the institutional framework, the creation of a currency board involves a set of decisions on specific design options, pertaining to the choice of the anchor currency, the specification of the reserve coverage requirement, and the parity.

4.2.2.1 Anchor Currency The choice of anchor currency involves three sets of considerations: the optimal currency area literature suggests pegging the exchange rate to a country subject to very similar shocks; the trade and investment integration literature suggests anchoring to the currency of a major trading partner; and the policy credibility literature suggests linking to a "strong" currency that enjoys low-inflation credibility.

These three considerations may but need not coincide: for example, a raw materials exporter may be subject to asymmetric shocks relative to its main trading partners; alternatively, the main trading partner might suffer from high inflation. Some CBA countries, including the euro boards, are fortunate in that all considerations point toward the same anchor currency; but it is noteworthy that even among these countries, Lithuania started its currency board with a peg to the U.S. dollar rather than the deutsche mark (DM) (see chapter 11). In other cases, such as

the (subsequently abandoned) efforts at introducing a currency board in the West Bank and Gaza, the choice of an optimal anchor currency was much more controversial.

In case of competing criteria, the currency board could in principle be based on multiple currencies. An alternative avenue explored by Oppers (2000) is the use of a dual currency board structure to avoid overvaluation through an automatic market-driven switch in anchor currency once an appreciation threshold is crossed. In practice, single currency anchors have proven the preferred choice; all modern boards have opted for a single hard currency anchor, predominantly choosing either the U.S. dollar or the DM/euro based on bilateral economic ties.[4] In a number of cases, the anchor currency has been altered in response to changing circumstances while the board was maintained. Examples include the switch of the East Caribbean countries from sterling to dollar as ties to Britain weakened and dollar trade and tourism grew in importance, and the switch of Lithuania from the U.S. dollar to the DM and then to the euro as trade flows adjusted.[5]

4.2.2.2 The Reserve Coverage Requirement The backing requirement for domestic money distinguishes the CBA from the traditional adjustable peg by sharply limiting the scope for monetary policy discretion. Implementation of the backing requirement requires three decisions: the underlying monetary aggregate to be covered, the reserve coverage ratio for stocks and/or flows, and the permissible reserve assets.

Given the high opportunity costs of holding typically low-yielding reserves, the choice of the monetary aggregate to be covered by reserves frequently involves a trade-off between a high coverage ratio for a narrow aggregate and a lower coverage ratio for a broader aggregate.[6] While there is no commonly agreed minimum threshold of coverage for a regime to qualify as a currency board, we use a de jure reserve ratio of at least 50 percent for our classification.[7]

A case could be made for imposing maximum coverage ratios.[8] In countries adopting CBAs to address persistent doubts about their ability to conduct discretionary monetary policy, the remaining scope for discretionary policy implied by excess reserves carries a potential credibility risk. The very same discretion of course also permits limited LOLR operations or other interventions benefiting financial stability, potentially enhancing credibility given the well-known tendency of monetary authorities to opt for financial over exchange rate stability

in times of crisis.[9] A widely discussed instance illustrating these considerations was the decision by the Hong Kong Monetary Authority to use excess reserves to help stabilize the stock market in the aftermath of the Asian crisis. In practice, maximum ratios have not proven popular.

A further decision concerns the use of gross versus net reserves. A gross measure allows the monetary authorities to use certain types of longer-term international borrowing to augment reserves and, if desired, increase the money issue, thus creating an avenue to undertake LOLR actions, but also to engage in the type of activist monetary policy that motivated the adoption of a CBA in the first place. The more stringent net reserve requirement eliminates this option. Beyond this fundamental choice, practical considerations often apply since some countries contemplating the introduction of a CBA may not have sufficient net reserves to achieve the required coverage ratio. A case in point is provided by Bulgaria, which eventually opted for a gross measure allowing the use of borrowed resources from the International Monetary Fund as part of its initial reserve coverage.

The final decision concerns the specification of permissible reserve assets. Most modern boards have followed the practice of the early boards to restrict investment options for reserves to deposits and sovereign debt instruments of the anchor country, at times augmented by precious metals (Bulgaria). Argentina partially diverged by recognizing a limited amount of Argentinean sovereign debt denominated in U.S. dollars. Since such debt is a claim on national foreign currency assets that also underpin the currency board, these exceptions carry credibility risks.

4.2.2.3 The Parity As with any other fixed exchange rate regime, choosing the parity is a tricky problem. For CBAs, the parity may be expected to apply for a prolonged period so the choice is particularly important.[10] In particular in countries adopting CBAs as part of a stabilization program, selecting a slightly undervalued rate allows for a competitiveness cushion if inflation differentials relative to the anchor currency remain initially positive. Over the longer term, the choice of nominal parity is of secondary importance provided labor and goods markets are sufficiently flexible, though too low an initial parity will lead to inflation as the real exchange rate adjusts to its long-run equilibrium.

4.2.3 Exit Options

In many countries, CBAs at their introduction are implicitly or explicitly portrayed as near-permanent institutions eliminating the scope for monetary mischief. In this broader framework, discussion of exit options, much like prenuptials, risk undermining the very credibility gain motivating the adoption of a CBA. Yet in practical terms, no regime is permanent, and responsible policymaking must incorporate exit scenarios, just as financial markets will certainly embed them in their calculations. In the event, most modern currency boards are set up as open-ended commitments without explicit exit clauses (Camilleri Gilson 2004) though the statutes in Argentina, Bulgaria, and Estonia contain references to revocation arrangements, if not a straight exit clause. One exception is the preannounced exit from Turkey's (2000) quasi-currency board arrangement (box 4.2).

Notwithstanding this choice, most if not all CBAs will have to confront the exit question at some point. While not part of the institutional setup proper, a discussion of the options is thus relevant in the broader framework of CBAs. The question of an eventual exit from a currency board arises in different forms depending on the motivation of the original adoption and the success in obtaining the objectives. Countries successfully adopting the currency board as a disinflation device must decide whether the CBA should give way to more flexible arrangements, while countries that have achieved some initial stabilization success but continue to face credibility concerns may conversely opt for a further hardening of the regime via dollarization.

4.2.3.1 Exits to More Flexible Regimes At the time the modern CBAs were adopted, the perceived benefits of monetary discipline and stability outweighed the costs associated with the loss of discretionary policy and the use of the exchange rate as an adjustment tool. The cost-benefit calculus is, however, likely to change over time. Once price stability is attained, other factors such as the reduced scope for LOLR policies may gain weight, prompting a consideration of a potential exit.[11] A crucial criterion in this assessment is the extent to which disinflation and any associated credibility gain is conditional on the continued operation of the CBA and thus on the credibility price, if any, of moving toward a more flexible system.

If an exit decision is made, the technically easiest exit from a currency board is to a corresponding pegged exchange rate regime, which

Box 4.2
Turkey's quasi currency board arrangement

Turkey's "quasi currency board"—adopted on January 1, 2000, as part of an IMF-supported stabilization program—entailed a number of features similar to a currency board while attempting to maintain the flexibility of a floating exchange rate regime over the medium term. Following a very successful initial disinflation under the program, the currency board suffered a major confidence crisis in November 2000, sparked by a banking crisis against the background of a sharp real exchange rate appreciation and a widening current account. Assisted by a large augmentation of reserves from the IMF, the regime survived but was abandoned in February 2001 in the face of a second crisis—this one triggered mainly by political concerns.

The impetus for a rules-based system stemmed from Turkey's past failures to address its chronic inflation. During previous disinflation attempts, the lack of a credible nominal anchor had proven a major difficulty in changing expectations and rapidly reducing nominal interest rates, so that—as actual inflation fell from more that 100 percent in 1997 to around 65 percent in 1999—real interest rates skyrocketed, pushing the government's interest bill to more than 20 percent of GDP by 1999 and pushing the economy into deep recession.

A classic currency board was considered but judged undesirable. First, given the relatively long maturity of the government's debt, nominal interest payments were largely predetermined. A rapid disinflation would thus, through sharply rising real interest rates, have put a large burden on public finances. Second, over the longer run, with the economy traditionally subject to real shocks and with little immediate prospect of EU membership, let alone entry into EMU, the authorities wanted to return to a more flexible regime once disinflation had been achieved and credibility established.

With these considerations in mind a "hybrid system" was designed that included three defining features. First, the central bank committed one year in advance to a pre-announced crawling peg for the nominal exchange rate. Second, the regime included a pre-announced exit strategy. Eighteen months after the introduction of the regime a symmetric intervention band was to be introduced and widened over time. Third, to enhance credibility, during the initial eighteen months of the new regime central bank operations were to follow "currency board rules," allowing base money to be created only from balance of payments flows, thus ruling out central bank credit to either the public or the private sector.

While the regime succeeded in rapidly reducing inflation and nominal and real interest rates, Turkey's long standing banking sector problems, coupled with an appreciating real exchange rate and widening current account deficit, eventually lead to the demise of the system. When a liquidity crisis hit the banking system in November 2000, the central bank violated the regime's stricture on credit expansion but, drawing on IMF resources, was able to avoid a devaluation. A few months later, however, the regime was abandoned in the context of a second crisis.

would preserve the nominal parity. The pegged regime could initially continue to operate de facto under the currency board strictures before gradually relaxing the reserve ratio and moving toward a more active monetary policy as both public institutions and private financial markets adjust to the new system. As discussed in chapter 2, this gradual exit—initially taking the form of relaxing the de jure coverage requirement—was the preferred exit for the early boards, with no apparent initial adverse effects.[12]

4.2.3.2 Exit to Harder Regimes The alternative is an exit to a harder regime, be it unilateral dollarization or monetary union. Dollarization can take a number of forms: orthodox—the outright adoption of another country's currency as the sole legal tender—or a hybrid such as dual systems under which a foreign currency is adopted as a second legal tender in addition to a local currency based on a currency board.[13] Moreover, dollarization can be unilateral,[14] bilateral (on the basis of an agreement or a tacit understanding with the issuing country),[15] or multilateral (Gruson 2002).[16]

Dollarization may be attractive for countries with remaining credibility issues, where the adoption of the foreign currency promises a reduction in the currency risk premium,[17] and thus lower debt service costs, and may halt inflation dynamics; for countries with extensive liability (but not asset) dollarization wishing to avoid the vulnerabilities arising from a possible collapse of the currency board and devaluation; and for small very open economies with a dominant trading partner, where adoption of the partner currency may reduce transactions costs and thus foster greater trade and tourism. The potential gains from dollarization must be weighed against the costs, including a loss of seigniorage (unless the anchor country agrees to share its seigniorage)[18] and further restrictions on monetary lender of last resort capabilities, again unless by prior agreement with the anchor country.[19]

At a technical level, exit into dollarization from an intact currency board poses decidedly fewer problems than dollarization starting from a floating regime. Indeed, in terms of the major institutional requirements for dollarization—setting the conversion rate, funding the foreign currency circulation, preparing for the loss of the exchange rate adjustment tool, and converting existing nominal contracts in domestic currency (Levy-Yeyati and Sturzenegger 2003)—currency boards enjoy a substantial head start.

The eventual move from a euro-based CBA to Eurozone membership presents a particularly attractive variant of an exit to a hard peg, sidestepping many of the drawbacks of classic dollarization but, most important, retaining access to both a share of the seigniorage and to LOLR functions.[20]

4.3 Design Choices in Modern Currency Boards

How have modern currency boards been designed in terms of these trade-offs? Appendix 1 at the end of the book provides a detailed account, revealing a number of key features:

- Two anchor currencies, the U.S. dollar and the euro, dominate.
- All boards allow foreign reserves proper (not necessarily solely in the anchor currency). In some boards the reserve position at the IMF is counted toward the reserve cover. With the exception of Argentina, which allowed a limited portion of U.S. dollar denominated Argentine government debt, CBAs require that foreign currency assets to be counted as backing be issued by foreign entities.
- With the exception of the East Caribbean arrangement, all CBAs require full coverage of at least narrow money, and in practice, all—including the East Caribbean arrangement—maintain more than full coverage.
- In all cases, base money is convertible into the anchor currency at the fixed parity. In most CBAs the convertibility is one-sided; the boards are not obliged to purchase the anchor currency in exchange for domestic currency. With the exception of Bulgaria, all boards limit the convertibility privilege to commercial banks.
- Legal structures differ. In Bosnia and Herzegovina and in Bulgaria, the currency board is established within a unified central bank law, while in Argentina, Estonia, and Lithuania, the central bank law has been augmented by a separate currency board law. In Argentina, Bosnia and Herzegovina, and Bulgaria, the law explicitly contains the convertibility guarantee, the backing rule, the anchor currency and the parity, requiring a change in the law to alter any of these parameters.
- All boards except Hong Kong impose reserve requirements on bank liabilities of varying size. Most incorporate limited additional lending facilities, mainly overnight. In spite of the possible complications for transparency, many CBAs also act as bankers to the government.

• The central banks of Estonia and Lithuania do not have formal LOLR functions, but are not prohibited from using excess reserves for LOLR operations. Bosnia and Herzegovina is the only board that expressly prohibits a LOLR function, with Argentina, Bulgaria, and Hong Kong allowing LOLR operations in response to systemic risk subject to the availability of excess backing; in Bulgaria, reserves for this purpose are earmarked in a separate fund held in the banking department.

Notwithstanding this apparent diversity, modern boards can be divided into two broad categories. The first comprises the early adopters, including the Cayman Islands, the members of the East Carribean arrangement, Brunei-Darussalam, and Djibouti. These boards retain much of the flavor of the early boards, including their root in trade facilitation rather than stabilization objectives. In most cases, their economies have over the decades adjusted well to the strictures of the monetary regime, which is generally not a politically controversial issue.

The second group consists of the more recent cases; generally countries that adopted currency boards in a deliberate attempt to import credibility, either in the context of stabilization programs (Argentina, Bulgaria, to some extent Lithuania, and in a much more limited sense Hong Kong) or as an initial arrangement in a newly independent country (Bosnia and Hevzegovina, Estonia). For these countries, the currency board is a crucial component of a reform package and often remains a contentious political issue for some time after its adoption.

4.4 Ranking the Boards

Among the credibility-motivated currency boards, the variations in institutional setup permit a subjective ranking of the de jure strictness of requirements. Camilleri Gilson (2004) constructs such a ranking, based on seven criteria: (1) the clarity of the legal basis, (2) the quality of reserve coverage, (3) the coverage of monetary aggregates, (4) the claims on reserves, (5) operational autonomy, (6) transparency and accountability, and (7) escape clauses (table 4.1).

The extreme positions are occupied by the Hong Kong CBA, which retains substantial scope for discretionary policy, and the highly restrictive CBA in Bosnia and Herzegovina. Estonia places close to Bosnia and Herzegovina, differing only in the clarity of the legal basis. Relative to these hard CBAs, Bulgaria's lower score reflects the lesser

Table 4.1
The Camilleri-Gilson index of precommitment

	Hong Kong (SAR)	Lithuania	Argentina	Bulgaria	Estonia	Bosnia and Herzegovina
Clarity of legal basis	0.25	0.75	0.5	0.75	0.5	1
Reserve coverage	0	0	0	1	1	1
Coverage of monetary aggregates	0	0	0	0	1	1
Claims on reserves	0	0	1	0.33	1	1
Operational autonomy	0.5	1	0.75	0.75	1	1
Transparency/accountability	0.5	1	1	1	1	1
Escape clauses	0	0	0.5	0.5	0.5	0.5
Scaled index	0.18	0.39	0.54	0.62	0.86	0.93

Source: Camilleri Gilson 2004, 21.

automaticity of adjustment, while Argentina's score is reduced by the weaker reserve coverage rules. Lithuania places lowest among the 1990s CBAs reflecting weaker lending limits.[21]

It bears emphasizing that this index pertains to the formal or de jure strictness of various CBAs. The ultimate credibility of a regime is driven by both the strength of the de jure limits and the assessment of de facto implementation, which need not coincide. Indeed, relatively less rigid arrangements could reflect greater confidence in the intrinsic commitment of the authorities to play by the rules of the game.

4.5 Conclusions

The introduction of a currency board involves myriad decisions. Within the confines of the CBA, authorities retain a choice between highly restrictive systems with explicit lending limits and strict net reserve requirements and more flexible arrangements built around a gross reserve requirement. The choice reflects the traditional trade-off: greater flexibility enhances both the ability to respond to shocks and the scope for monetary mischief. A tight classical setup avoids these temptations but fully exposes the country to events in the anchor country. Countries recently adopting currency boards have selected institutional frameworks within these extremes, with Lithuania and Argentina selecting more flexible arrangements and Estonia and Bosnia and Herzegovina opting for more restrictive rules. In the case studies that follow, we discuss these choices in more detail.

The trade-off between flexibility and credibility must also be faced in the choice and design of an exit clause or strategy. Most modern currency boards have opted against explicit exit rules for fear of undermining confidence. Whether confidence would indeed be harmed if the exit were made conditional on achieving strict verifiable performance criteria is an open question. The one example of a preannounced exit strategy from a quasi-currency board exchange rate regime (Turkey; box 4.2) ended in crisis before the planned exit date. At the same time, postponing the exit debate may generate an expectation of permanence—ultimately constraining future options as exits even from a position of strength may be viewed as broken promises.

II

Macroeconomic Performance

5 Stylized Facts

5.1 Introduction

The arguments developed in chapter 3 suggest that currency boards might deliver low inflation, though possibly at the cost of slower output growth, higher volatility, and greater susceptibility to crises. Whether, in fact, they do deliver such benefits—and at what cost—can only be resolved empirically. In this chapter, we take a first look at the evidence, reporting summary unconditional means and variances for key macroeconomic variables under currency boards, other pegged regimes, and floating regimes.[1] Of course, the unconditional statistics do not take account of other factors influencing macroeconomic performance, nor do they permit inferences about possible directions of causality. In chapters 6 (inflation) and 7 (growth, trade, and volatility), we turn to econometric analysis to explore these aspects.

Since nominal exchange rate regimes should primarily if not exclusively affect nominal variables, we start in section 5.2 by considering the behavior of inflation, money growth, and interest rates under various exchange rate regimes. Section 5.3 turns to the "real" side of the economy—exports, investment, and output growth. Section 5.4 examines whether countries with currency boards—and thus limited scope for lender of last resort operations—are more susceptible to financial crises. Section 5.5 concludes.

5.2 Inflation, Money Growth, and Interest Rates

Our empirical analysis is based on a dataset of macroeconomic variables drawn primarily from the International Monetary Fund's World Economic Outlook database. The sample covers 147 countries (a subset of the 165 countries for which the exchange rate regime is available)

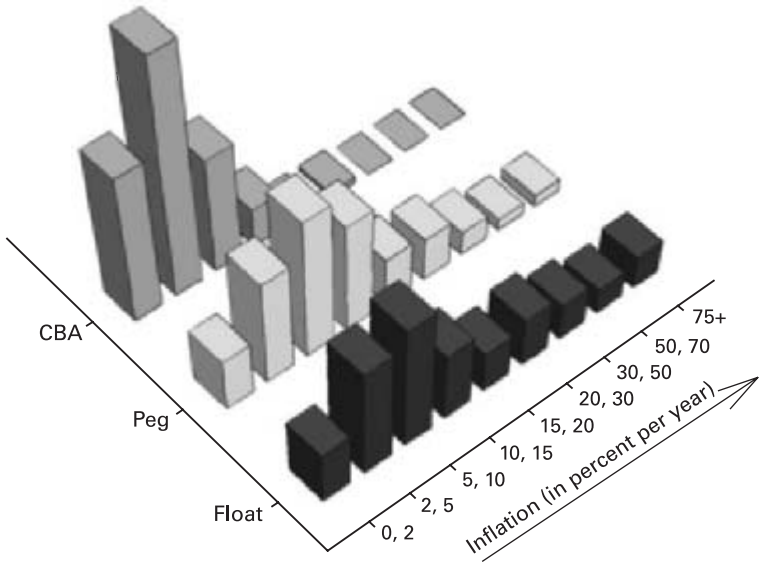

Figure 5.1
Frequency distribution of inflation rates by exchange rate regime

over the period 1970–2002; taking account of lags and missing values leaves some three thousand observations for most variables and about two thousand observations for much of the econometric analysis that follows. Appendix 2 provides a fuller description of the data.

Since summary statistics for inflation can be skewed by a few outliers, it is useful to start with the frequency distribution of inflation rates under alternative regimes (figure 5.1). The figure reveals that currency boards are associated with low inflation: more than 90 percent of the currency board observations fall in the 0–10 percent per year range, compared to around one-half of the observations for other pegged regimes or floating regimes; the latter have a fatter tail at the upper end of the distribution.

Table 5.1 reports average inflation rates across regimes; to check for the influence of hyperinflation outliers, the median and a "scaled" inflation rate, $\tilde{\pi} = (\pi/(1+\pi))$, are reported as well. Consistent with figure 5.1, average inflation rates have indeed been much lower under currency boards. Against a sample average of 18.7 percent per year for all regimes and 14.6 percent per year for traditional pegs, the average inflation rate for currency boards comes in at 5.7 percent per year. To further assess robustness, we also split the sample into four subgroups:

Table 5.1
Macroeconomic performance under alternative exchange rate regimes: Money, inflation, and fiscal balance

	Inflation		Money growth		Interest rate		Government balance	
	π	$\pi/(1+\pi)$	μ	$\mu/(1+\mu)$	Nominal	Real	(in percent of GDP)	Number of observations
	(in percent per year)							
All regimes	17.7	11.1	22.5	15.2	9.8	2.1	−4.0	3272
Currency board	5.7	4.9	12.6	10.4	5.9	−0.8	−2.5	147
Pegged regimes	13.6	9.6	18.5	13.6	9.6	2.0	−4.4	1792
Floating regimes	24.9	13.9	29.2	18.0	10.0	2.3	−3.7	1333

countries classified by the World Bank as upper- or upper-middle-income countries; countries classified by the World Bank as lower- or lower-middle-income countries; countries without current account restrictions; and countries without capital account restrictions. To avoid overburdening the text with tables, the results, alongside a brief summary discussion, are provided in an appendix to the chapter. With few exceptions, the ranking across regimes is robust across subsamples.

The model developed in chapter 3 suggests that monetary and fiscal discipline may be one determinant of the better inflation performance. Table 5.1 is consistent with this view emphasizing greater monetary and related fiscal discipline.[2] Scaled money growth rates $(\mu/(1+\mu))$ average 10 percent per year under currency board arrangements compared to 14 percent per year under simple pegs and 18 percent per year under floating regimes, while fiscal deficits are about 1 to 2 percent of GDP smaller under currency boards than under other regimes.

The model developed in chapter 3 further suggests that currency boards, by imposing greater monetary discipline, should also be associated with greater confidence in the domestic currency, leading to faster growth in money demand and thus lower inflation for a *given* rate of money and output growth. To explore this possibility, figure 5.2 plots inflation rates against broad money growth rates under currency boards, other pegs, and floats. The relationship for currency boards always lies below those for other pegs and floats, implying that inflation is indeed lower under a currency board (compared to other regimes) for a given rate of money growth—as the "confidence" effect would imply. This greater confidence is reflected in the lower nominal and real interest rates under currency boards.[3]

5.3 Exports, Investment, and Output Growth

The theoretical case for a link between the nominal exchange rate regime and the level or growth rate of exports or GDP is tenuous, though theory does suggest a possible positive association between the adoption of fixed exchange rates and real volatility because the nominal exchange rate is no longer available as an adjustment tool. In exploring the evidence, it is again useful to start with the frequency distribution of real per capita growth across regimes. Figure 5.3 suggests a greater dispersion of growth experiences under currency boards compared to

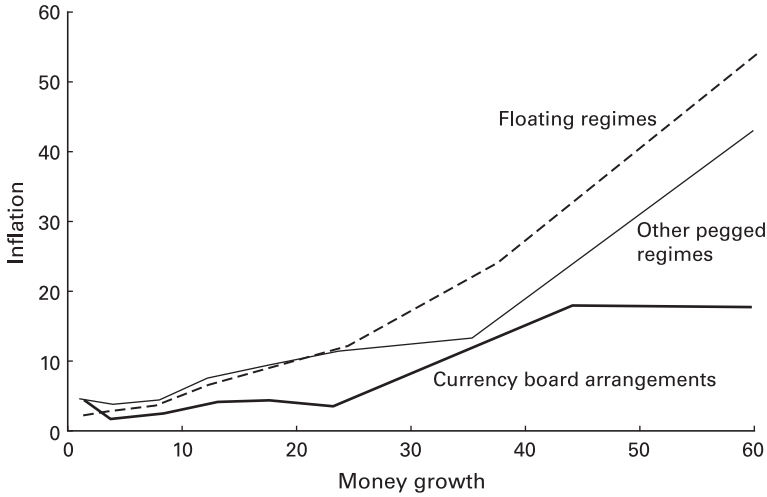

Figure 5.2
Inflation and broad money growth under alternative exchange rate regimes (in percent per year)

other regimes. For instance, some 30 percent of the currency board observations are at zero or negative per capita growth rates, compared to 25 percent of floating regime observations. But currency boards also have a larger share of very high growth rates—one quarter of the per capita GDP growth rate observations exceed 5 percent per year, compared to 15 percent of the floating regime observations.

As table 5.2 reveals, average annual per capita output growth under currency boards at 2.7 percent per year substantially exceeds that under other pegged regimes (1 percent) and under floats (1.8 percent). While not addressing causality, the table furthermore suggests that the additional growth may in part reflect both greater trade openness and higher investment rates. The latter are 3–4 percentage points of GDP higher than under other regimes, consistent with the view that currency boards result in lower real interest rates through reduced risk premia. While the growth difference is impressive at first sight—suggesting a win-win scenario of adopting CBA—some caution is warranted. Many boards were adopted in the midst of economic crisis; given the short duration of most modern boards, their growth records may to a degree reflect the bounce back to trend output following successful stabilization rather than a higher sustainable growth rate of trend output itself.

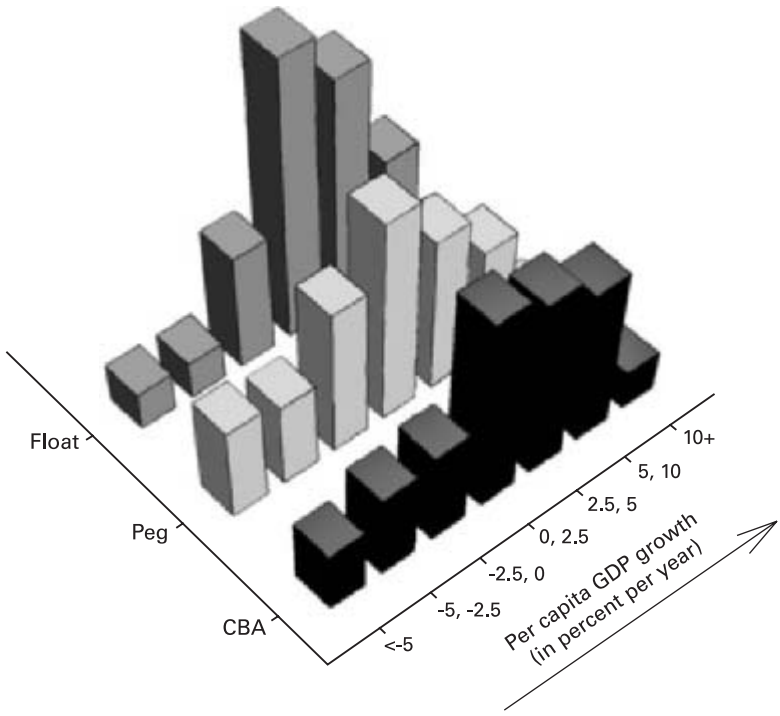

Figure 5.3
Relative frequency distribution of growth rates by exchange rate regime

Table 5.2 also reports the average volatility of output growth (measured as the centered standard deviation of the real GDP growth rates over three years). While countries with CBAs grew faster than those with other regimes, countries with exchange rate pegs (whether a currency board or a simple peg) also experienced more volatile growth (a standard deviation of 5 percent per year compared to 4 percent per year under floats), suggesting that the loss of the nominal exchange rate as an adjustment tool indeed has a volatility cost. It is worth noting that the coefficient of variation—the mean divided by the standard deviation—is highest for currency board regimes; the greater volatility is thus at least well compensated by high average growth.

In addition to possible negative effects of a CBA adoption on output growth (not supported by the unconditional statistics) and impact on volatility (supported), a third potential negative real effect might be on export growth if residual inflation differentials relative to the anchor country accumulate over time into pronounced real overvaluation.

Table 5.2
Macroeconomic performance under alternative exchange rate regimes: Output growth and trade performance

	GDP growth			Per capita GDP			Export growth			Invest-ment	Trade openness	Current account	Number of observations
	μ	σ	μ/σ	μ	σ	μ/σ	μ	σ	μ/σ				
	(in percent per year)									(in percent of GDP)			
All regimes	3.4	4.4	0.8	1.4	4.5	0.3	6.7	24.4	0.3	21.4	74.2	−4.1	3272
Currency board	3.5	4.4	0.8	2.7	4.9	0.6	7.6	14.4	0.5	25.3	142.4	−9.6	147
Pegged regimes	3.4	4.8	0.7	1.0	4.9	0.2	5.6	24.2	0.2	21.2	74.4	−4.3	1792
Floating regimes	3.3	3.8	0.9	1.8	3.8	0.5	8.1	25.6	0.3	21.4	66.4	−3.1	1333

The unconditional statistics reveal that export growth, at 7.6 percent per year under currency boards, indeed fell slightly short of the 8.1 percent per year under floating regimes. In contrast to the findings for inflation, GDP growth, and interest rates, however, the export growth finding is not robust across country subgroups. While export growth under currency boards exceeded export growth under floating rates among high- and upper-middle-income countries (8.2 versus 6.3 percent per year), it fell short in lower- and lower-middle-income countries (6.8 versus 9.8 percent per year). The volatility of export growth under CBAs, at 14 percent per year, was considerably lower than the 25 percent per year for floats.

In contrast to the small differences in export growth rates, current account deficits were markedly higher under CBAs, averaging 9 percent of GDP compared to 3–4 percent of GDP under other pegs and floats. The unconditional data do not allow an assessment whether the differences reflect serious competitiveness problems, large capital inflows into rapidly growing countries readying themselves for European Union and eventual EMU entry, or special factors such as reconstruction aid received by Bosnia and Herzegovina.

5.4 Lender of Last Resort and Financial Crises

Beyond macroeconomic performance, the exchange rate regime may have implications for the susceptibility of the financial sector to crises. As discussed in chapter 4, a pegged exchange rate—a fortiori a currency board arrangement—may severely constrain the ability of the central bank to act as lender of last resort, making the banking sector more vulnerable to deposit runs and crises, though perhaps for the same reason also more prudent in its lending decisions.

To explore whether there are indeed systematic cross-regime differences in financial crises, table 5.3 reports the proportion of observations of each regime in which a banking crisis either started or persisted (labeled "duration" in the table).[4] The table reveals a comparable incidence of crises under currency boards and other pegged regimes, and a considerably higher incidence for floating regimes.[5]

There is thus no evidence that CBAs, or pegged exchange rate regimes more generally, are associated with a higher incidence of banking crises; indeed, the opposite case seems to apply. Notwithstanding this finding, CBAs may nevertheless increase the vulnerability of the financial sector by encouraging liability dollarization. The

Table 5.3
Incidence of banking crises under alternative regimes

	Number of observations		Proportion (in percent)
	Crisis	Total	
	All regimes		
Start of banking crisis	145	4,676	3.1
Duration of banking crisis	631	4,676	13.5
	Currency board		
Start of banking crisis	5	211	2.4
Duration of banking crisis	20	211	9.5
	Other pegged regimes		
Start of banking crisis	56	2,130	2.6
Duration of banking crisis	254	2,130	11.9
	Floating regimes		
Start of banking crisis	79	1,710	4.6
Duration of banking crisis	343	1,710	20.1

Source: Based on Glick and Hutchison 2001, updated by authors.

empirical evidence is mixed. The share of foreign currency bank deposits (for a subset of eighty-eight countries for which the data are reported) from 1990 to 1999 comes to 23 percent for countries with currency boards, 12 percent for other pegged exchange rate regime countries, and 30 percent for countries with floating regimes. The differences in proportions are statistically significant, but the significance disappears once one controls for country fixed effects capturing, among others, the inflation history of the country—a likely determinant of the degree of dollarization. Thus, if anything, fixed exchange rate regimes, including currency boards, are associated with less dollarization than countries with floating regimes.[6]

5.5 Conclusions

This first snapshot of the empirical evidence provides substantial support for the theoretical arguments presented earlier. In particular, currency boards are associated with lower inflation compared to other fixed exchange rate systems and floating rates; the evidence is consistent with the presence of both a monetary discipline effect (lower money supply growth) and a confidence effect (lower velocity growth). Perhaps more surprising, there is little evidence that countries with

currency boards grew more slowly; indeed, they substantially outperform the other regimes, though this may reflect a temporary rebound of output from depressed levels at the time of the CBA adoption. Nor is there evidence for a greater susceptibility to financial crisis or dollarization of the banking system, or significantly reduced export competitiveness. As theory would predict, however, countries operating under CBAs did experience more volatile output growth, presumably because of the loss of the nominal exchange rate as an adjustment tool.

Do these findings reflect a causal link running from currency boards to better growth and inflation performance? Alternatively, do they reflect the effects of third factors that drive both inflation and growth performance? Are they perhaps a reflection of reverse causality, whereby countries with preferences for low inflation are more likely both to adopt and to maintain CBAs? In the following chapters we scrutinize the data more carefully, taking account of these possible alternative explanations.

Appendix: Results for Subgroups

The following table replicates the text tables for four subgroups: (1) countries classified by the World Bank as being upper- or upper-middle-income; (2) countries classified by the World Bank as being lower-middle-income or lower-income; (3) countries without current account restrictions; and (4) countries without capital account restrictions.

The results reveal that for inflation, growth, and interest rates, the ranking of subsamples matches the ranking of the full sample. Specifically, the table shows that across all country groups:

- Inflation is lower under currency boards than under other pegs and floating rates. The average inflation rate across all regimes is substantially lower for countries without current or capital account restrictions. For these two groups, monetary unions recorded the lowest average inflation rate.
- Per-capita GDP growth and the investment ratio are consistently highest under currency boards.
- Money growth, nominal and real interest rates, and fiscal deficits are consistently lowest under currency boards.
- The current account deficit is consistently wider under currency boards than under floating rates and other fixed rates. For countries

without current or capital account restrictions, deficits under monetary union are comparable to those under currency boards.

For export growth and volatility, the ranking is inconsistent across subsamples. While export growth under currency boards is consistently higher than export growth under other pegged regimes across subsamples, the ranking of currency boards and floats depends on the subsample, with currency boards experiencing somewhat faster export growth in upper-income and upper-middle-income countries as well as countries without current and capital account restrictions, but lower growth in lower- and lower-middle-income countries (table 5A.1).

Table 5A.1
Macroeconomic performance under alternative exchange rate regimes

	Inflation		GDP growth			Per capita GDP			Money growth	
	π	$\pi/(1+\pi)$	μ	σ	μ/σ	μ	σ	μ/σ	μ	$\mu/(1+\mu)$
	(in percent per year)									
Full sample										
All regimes	17.7	11.1	3.4	4.4	0.8	1.4	4.5	0.3	22.5	15.2
Currency board	5.7	4.9	3.5	4.4	0.8	2.7	4.9	0.6	12.6	10.4
Pegged regimes	13.6	9.6	3.4	4.8	0.7	1.0	4.9	0.2	18.5	13.6
Floating regimes	24.9	13.9	3.3	3.8	0.9	1.8	3.8	0.5	29.2	18.0
Upper- and upper-middle-income countries										
All regimes	13.5	8.7	3.3	3.9	0.9	1.9	4.0	0.5	20.0	13.2
Currency board	6.6	5.4	4.1	4.5	0.9	3.3	4.4	0.7	14.9	12.1
Pegged regimes	10.9	7.8	3.6	4.6	0.8	1.5	4.8	0.3	17.8	12.7
Floating regimes	17.1	10.2	2.9	3.0	1.0	2.1	3.0	0.7	22.9	13.9
Lower- and lower-middle-income countries										
All regimes	20.5	12.6	3.4	4.7	0.7	1.1	4.7	0.2	24.1	16.5
Currency board	4.7	4.2	2.9	4.2	0.7	2.1	5.2	0.4	10.1	8.5
Pegged regimes	14.8	10.5	3.3	4.8	0.7	0.8	4.9	0.2	18.8	14.0
Floating regimes	32.2	17.3	3.6	4.4	0.8	1.5	4.5	0.3	35.2	21.7
Countries with no current account restrictions										
All regimes	10.7	8.0	3.4	4.0	0.8	1.5	4.2	0.4	17.2	12.7
Currency board	5.6	4.7	3.1	4.1	0.8	2.3	5.0	0.5	11.9	9.8
Monetary union	4.6	4.0	3.9	3.6	1.1	1.6	3.5	0.5	13.9	11.5

Pegged regimes	7.8	6.7	3.6	4.5	0.8	1.1	4.6	0.2	15.2	11.8
Floating regimes	14.5	9.9	3.2	3.5	0.9	1.9	3.5	0.5	20.3	14.1
Countries with no capital account restrictions										
All regimes	9.8	7.2	3.5	4.2	0.8	1.6	4.3	0.4	16.6	12.4
Currency board	6.1	5.2	3.2	4.4	0.7	2.4	4.9	0.5	13.1	10.6
Monetary union	4.6	4.0	3.9	3.6	1.1	1.6	3.5	0.5	13.9	11.5
Pegged regimes	7.0	6.0	4.4	5.1	0.9	0.9	5.4	0.2	16.6	12.6
Floating regimes	12.3	8.3	3.1	3.4	0.9	1.9	3.3	0.6	17.4	12.6

Table 5A.1
(continued)

	Interest rate		Export growth			Government balance	Investment	Trade openness	Current account	Number of observations
	Nominal	Real	μ	σ	μ/σ					
	(in percent per year)					(in percent of GDP)				
Full sample										
All regimes	9.8	2.1	6.7	24.4	0.3	−4.0	21.4	74.2	−4.1	3,272
Currency board	5.9	−0.8	7.6	14.4	0.5	−2.5	25.3	142.4	−9.6	147
Pegged regimes	9.6	2.0	5.6	24.2	0.2	−4.4	21.2	74.4	−4.3	1,792
Floating regimes	10.0	2.3	8.1	25.6	0.3	−3.7	21.4	66.4	−3.1	1,333
Upper- and upper-middle-income countries										
All regimes	9.8	2.0	6.0	10.0	0.6	−2.8	23.1	86.2	−1.2	1,275
Currency board	5.9	−0.8	8.2	10.5	0.8	−1.7	26.5	163.7	−8.1	77
Pegged regimes	9.7	1.9	5.7	12.0	0.5	−2.2	24.0	97.7	−0.1	556
Floating regimes	10.0	2.1	6.3	7.7	0.8	−3.3	22.0	67.4	−1.1	642
Lower- and lower-middle-income countries										
All regimes	10.7	5.3	7.1	30.2	0.2	−4.8	20.4	66.4	−5.9	1,997
Currency board	—	—	6.8	17.8	0.4	−3.4	24.0	119.1	−11.3	70
Pegged regimes	7.8	3.8	5.6	27.9	0.2	−5.3	19.9	63.9	−6.1	1,236
Floating regimes	11.7	5.7	9.8	34.6	0.3	−4.0	20.9	65.4	−4.9	691
Countries with no current account restrictions										
All regimes	9.3	2.7	5.9	12.9	0.5	−3.2	22.0	83.8	−3.0	1,767
Currency board	5.9	−0.8	7.2	13.2	0.5	−2.4	25.1	148.2	−9.2	115
Monetary union	—	—	1.5	12.8	0.1	−5.4	21.4	75.0	−7.4	30

Pegged regimes	9.4	2.5	5.1	14.8	0.3	−3.1	22.2	87.9	−2.6	841
Floating regimes	9.4	2.9	6.6	10.5	0.6	−3.4	21.5	70.7	−2.4	811
Countries with no capital account restrictions										
All regimes	6.9	3.2	5.9	11.5	0.5	−2.8	22.3	89.9	−1.0	804
Currency board	5.9	−0.8	8.1	13.9	0.6	−2.7	24.4	159.0	−6.9	73
Monetary union	—	—	1.5	12.8	0.1	−5.4	21.4	75.0	−7.4	30
Pegged regimes	6.9	4.3	5.3	13.8	0.4	−2.7	23.5	105.3	2.0	260
Floating regimes	6.9	3.3	6.1	9.3	0.7	−2.7	21.4	71.7	−1.3	471

6 Inflation and Disinflation under Alternative Exchange Rate Regimes

6.1 Introduction

The basic statistics reported in chapter 5 suggest an impressive performance under currency boards when compared to either floating exchange rate regimes or other, softer pegs. Not only are currency boards associated with lower inflation, they also seem to deliver higher per capita output growth. But are these findings merely serendipitous—reflecting, for example, the influence of third factors—or are they indeed properties inherent in the exchange rate regime? In this chapter, we delve deeper into our findings on inflation—distinguishing between the short-run impact of adopting a currency board and the longer-run performance of such regimes—exploring alternative explanations and undertaking a battery of robustness tests. Chapter 7 does much the same for the stylized facts on output growth.

Inflation, of course, depends on much more than just the exchange rate regime. Other determinants include money growth, fiscal policy, and central bank independence—some of which are in turn endogenous to the regime. As the unconditional statistics reported previously do not control for these other factors, they risk misattributing the effects of omitted variables to the exchange rate regime. In this chapter, we estimate regressions relating the inflation rate to a variety of determinants suggested by the literature, as well as to two dummy variables representing pegged exchange rate regimes (other than currency boards) and floating exchange rate regimes. In this framework, a significant coefficient on either dummy variable indicates that inflation under a currency board differs from that under a soft peg or a floating regime, controlling for other factors.

Yet this is not the only possible channel, as the exchange rate regime can also affect the country's inflation performance indirectly by

influencing one of these other factors. In particular, money growth is a key determinant of inflation, but, as the model developed in chapter 3 suggests, the rate of money growth is itself likely to depend upon the exchange rate regime. In the regressions reported here we explicitly identify both the indirect effect of the exchange rate regime operating through the endogenous money growth rate (a "discipline" effect) and the effect of the regime conditional on money growth that, following the theoretical model, could reflect the greater credibility of monetary policy stemming from the adoption of the peg or currency board (a "confidence" effect).

Beyond the influence of other factors, another possibility is that the exchange rate regime itself is endogenous to the country's inflation performance. Simply put, countries that have lower inflation may be better able to maintain a peg or a currency board. The causality could thus run the other way: countries with low inflation maintain currency boards, rather than countries maintaining currency boards consequently enjoying lower inflation. Since most of the modern boards have been adopted in situations of high inflation or even hyperinflation,[1] it is clearly not the case that countries with low realized inflation rates *adopt* currency board arrangements, but this does not preclude the possibility that only countries with low inflation are able to *maintain* a currency board, suggesting that simultaneity bias could be important at least when assessing inflation performance over the medium term.

Ideally, one would control for this possibility by estimating a simultaneous equations system in which the decision to adopt a currency board depends, among other things, on the inflation rate. The fitted probability from this first-stage probit could then be used to estimate the impact of a currency board on inflation, controlling for any simultaneity bias. Such a system of equations will be econometrically identified as long as there exist variables that enter the country's decision to adopt the currency board (as opposed to either a float or a softer peg) but that are unlikely to influence the inflation rate directly. While it is relatively easy to find such variables for the decision between a float and a currency board (e.g., country size or geographical concentration of exports), it is less plausible that such variables could distinguish between the choice of a currency board and a soft peg.[2] With this limitation in mind, we report results from a simultaneous equation framework where the first-stage probit assumes that the alternative to a

currency board is either a soft peg or a float, as well as results when the two alternatives (a soft peg or a float) are considered separately.

Finally, we turn to the time path of effects. Modern currency boards have often been adopted in order to help lower inflation, both directly through the restrictions imposed on monetary authorities, and indirectly by anchoring inflationary expectations through the credibility of the regime. To what extent have such "exchange rate based stabilizations" been successful? And at what cost in terms of stifling exports or output growth? To address these questions, we examine success rates of disinflation episodes under alternative exchange rate regimes, both in terms of bringing down inflation and in terms of maintaining low inflation afterward. We also study the dynamics of other key macroeconomic variables—output growth, the real exchange rate, exports, and the current account balance—in the disinflation process under alternative regimes.

The plan of this chapter is as follows. Section 6.2 lays out the main inflation regression to examine the impact of a currency board controlling for other determinants of inflation. In section 6.3 we develop a simultaneous equation framework to explore whether currency boards are associated with lower inflation, controlling for possible simultaneity bias. We also report the results of various robustness tests. Section 6.4 examines the dynamics of key macroeconomic variables during disinflation under alternative exchange rate regimes. Section 6.5 concludes.

6.2 Baseline Regression

To examine the conditional link between inflation and currency boards, we regress the scaled inflation rate $\pi = (\tilde{\pi}/(1+\tilde{\pi}))$ (called "inflation" in what follows) on two exchange rate regime dummies for pegged (*Peg*) and floating (*Flt*) regimes, respectively, as well as a set of controls. Currency boards are the excluded category; thus the coefficients on *Peg* and *Flt* should be interpreted as the inflation differential in percentage points per year relative to currency boards.

6.2.1 Controls and Regression Methodology

The regression includes real GDP growth (ΔGDP) since faster output growth should raise money demand and lower inflation for a given expansion of the money supply, (Δm).[3] Beyond output and money

growth, the inflation literature suggests a number of additional determinants. Following Romer (1993), who argues that greater trade openness raises the costs of a monetary expansion, which, by the logic of the policy credibility models, should imply lower inflation in more open economies, we add the ratio of exports plus imports to GDP (*Open*).

The policy credibility literature suggests that an independent, "conservative" central banker can help solve the time-consistency problem (Rogoff 1985). Although it is difficult to measure the conservatism of the central bank governor, Cukierman (1992) uses the turnover rate (*CBTurn*) of the central bank governor as an (inverse) proxy for central bank independence, on the grounds that less independent central bank governors can be fired more easily. A higher turnover rate of the central bank governor (measured as the number of governors per five-year period) should therefore be associated with higher inflation. The remaining controls are terms-of-trade shocks (*TT*) (Fischer 1993) and the fiscal balance (*Fisc. Bal.*). Finally, we include annual dummies in the regression to capture shocks that are common across countries, but vary over time, such as oil price shocks. This also controls for any spurious correlation that could arise from the bunching of currency board observations during the low-inflation 1990s and 2000s. (Country fixed effects are included in one of the robustness regressions that follow.) Our core regression is thus

$$\pi = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{Mon} \Delta m + \beta_4 \Delta GDP + \beta_5 Open + \beta_6 CBTurn + \beta_7 \Delta TT + \beta_8 Fisc.\ Bal. + \varepsilon, \quad (1)$$

where the money growth rate, real GDP growth rate, and fiscal balance are instrumented by their lagged values to control for their potential endogeneity. All t-statistics reported are based on White (heteroskedastic-consistent) standard errors. The full sample period is 1972–2002 covering 99 countries, though for many countries data are missing over this period (or the country did not even exist as a separate economic entity) so the base regression consists of 2,189 observations.

In assessing the impact of other pegs relative to currency boards on inflation, we need to take account of both the direct effect of the regime, β_{Peg}, which we term the "confidence effect" (since it captures the behavior of velocity conditional on the money growth rate) and the indirect effect that the peg may have on inflation by exerting monetary discipline. The latter is given by $\beta_{Mon}(\overline{\Delta m}_{Peg} - \overline{\Delta m}_{Cbd})$, where $\overline{\Delta m}_{Peg}$

and $\overline{\Delta m}_{Cbd}$ are the average money growth rates under pegged and currency board regimes, respectively.[4] The total effect of a peg relative to a currency board is therefore

$$\gamma_{Peg} = \beta_{Peg} + \beta_{Mon}(\overline{\Delta m}_{Peg} - \overline{\Delta m}_{Cbd}). \quad (2)$$

Likewise, the full effect of a floating exchange rate (relative to a currency board) is given by

$$\gamma_{Flt} = \beta_{Flt} + \beta_{Mon}(\overline{\Delta m}_{Flt} - \overline{\Delta m}_{Cbd}).$$

6.2.2 Results

Table 6.1 reports the resulting regression coefficients. Nearly all of the control variables enter the regression with the expected sign and are statistically significant. Broad money growth is associated with higher inflation while higher output growth is associated with lower inflation (since it raises money demand for a given monetary expansion). More open economies have lower inflation (Romer 1993), while countries with less independent central banks (as captured by the turnover rate of the central bank governor) have higher inflation; a larger fiscal surplus is associated with lower inflation even controlling for money growth, suggesting aggregate demand effects may be important as well. The R^2 of the regression, at 0.27, is relatively low, perhaps because the sample covers such a diversity of countries. When the sample is split by per capita income groups, the corresponding goodness-of-fit statistics range from 0.4 to 0.6.

Turning to the effects of the exchange rate regime, inflation in countries with currency boards is, on average, 8 percent per year lower than inflation in countries with other pegged regimes and 22 percent lower than inflation in countries with floating regimes.[5] Both differences are highly statistically significant using heteroskedastic-consistent standard errors. Of the 8 percentage point differential with other pegged exchange rate regimes, 4.6 percentage points represent the effects of greater monetary discipline and 3.7 percentage points the greater confidence that currency board arrangements impart to the domestic currency. Correspondingly, of the 22 percentage point difference between floating regimes and currency boards, about one-half represents the greater discipline of currency boards relative to floating regimes; the other half represents the faster growth of money demand (the "credibility" effect). Even controlling for other likely determinants of inflation, there thus remain sizable differences in the inflation performance of currency boards compared to other regimes.

Table 6.1
Inflation performance of alternative regimes relative to currency boards
$\pi = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{Mon}\Delta m + \beta_4\Delta GDP + \beta_5 Open + \beta_6 CBTurn + \beta_7 \Delta TT + \beta_8 Fisc.\ Bal. + \varepsilon$

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
Full sample				
Constant	−0.012	−0.89	−0.012	−0.89
Pegged regimes	0.083	11.42***	0.037	5.82***
Floating regimes	0.216	18.22***	0.108	13.87***
Money growth	1.415	16.90***	1.415	16.90***
GDP growth	−1.349	−4.46***	−1.349	−4.46***
Trade openness	−0.030	−5.78***	−0.030	−5.78***
Central bank turnover	0.098	6.89***	0.098	6.89***
Terms of trade	0.007	0.53	0.007	0.53
Government balance	−0.170	−2.39**	−0.170	−2.39**
Number of observations, R^2	2189	0.27	2189	0.27
Upper- and upper-middle-income countries				
Constant	−0.038	−1.98**	−0.038	−1.98**
Pegged regimes	0.050	4.69***	0.042	4.00***
Floating regimes	0.127	9.68***	0.102	8.51***
Money growth	1.366	11.17***	1.366	11.17***
GDP growth	−0.063	−0.13	−0.063	−0.13
Trade openness	−0.038	−6.16***	−0.038	−6.16***
Central bank turnover	0.138	6.23***	0.138	6.23***
Terms of trade	0.038	1.49	0.038	1.49
Government balance	−0.079	−0.70	−0.079	−0.70
Number of observations, R^2	1043	0.41	1043	0.41
Lower- and lower-middle-income countries				
Constant	0.119	4.23***	0.119	4.23***
Pegged regimes	0.073	4.81***	−0.009	−0.62
Floating regimes	0.188	11.05***	−0.007	−0.44
Money growth	1.474	14.42***	1.474	14.42***
GDP growth	−0.079	−5.01***	−0.079	−5.01***
Trade openness	−1.614	−6.72***	−1.614	−6.72***
Central bank turnover	−0.018	−1.99**	−0.018	−1.99**
Terms of trade	0.027	2.23**	0.027	2.23**
Government balance	−0.017	−1.59	−0.017	−1.59
Number of observations, R^2	1146	0.57	1146	0.57

Table 6.1
(continued)

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
Countries without current account restrictions				
Constant	0.004	0.52	0.004	0.52
Pegged regimes	0.052	6.73***	0.022	3.06***
Floating regimes	0.131	13.97***	0.068	9.12***
Money growth	1.475	16.51***	1.475	16.51***
GDP growth	−1.089	−3.04***	−1.089	−3.04***
Trade openness	−0.013	−4.01***	−0.013	−4.01***
Central bank turnover	0.028	3.09***	0.028	3.09***
Terms of trade	−0.001	−0.08	−0.001	−0.08
Government balance	−0.168	−2.19**	−0.168	−2.19**
Number of observations, R^2	1257	0.58	1257	0.58
Countries without capital account restrictions				
Constant	0.018	1.72*	0.018	1.72*
Pegged regimes	0.021	1.87*	0.004	0.32
Floating regimes	0.058	5.12***	0.040	3.62***
Money growth	0.873	12.77***	0.873	12.77***
GDP growth	−0.555	−1.03	−0.555	−1.03
Trade openness	−0.008	−2.11**	−0.008	−2.11**
Central bank turnover	0.039	2.86***	0.039	2.86***
Terms of trade	−0.001	−0.10	−0.001	−0.10
Government balance	−0.091	−1.05	−0.091	−1.05
Number of observations, R^2	650	0.63	650	0.63
Low inflation observations[b]				
Constant	0.013	3.97***	0.013	3.97***
Pegged regimes	0.016	5.54***	0.008	2.90***
Floating regimes	0.024	7.76***	0.017	5.84***
Money growth	0.560	11.17***	0.560	11.17***
GDP growth	0.065	0.86	0.065	0.86
Trade openness	−0.008	−6.29***	−0.008	−6.29***
Central bank turnover	0.004	1.21	0.004	1.21
Terms of trade	0.006	1.83*	0.006	1.83*
Government balance	0.014	0.72	0.014	0.72
Number of observations, R^2	1252	0.32	1252	0.32

Table 6.1
(continued)

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
Countries with low turnover rate of central bank governor[c]				
Constant	0.072	2.59***	0.072	2.59***
Pegged regimes	0.074	6.12***	−0.002	−0.18
Floating regimes	0.114	9.49***	0.021	2.23**
Money growth	1.054	12.41***	1.054	12.41***
GDP growth	−0.900	−1.90*	−0.900	−1.90*
Trade openness	−0.011	−2.55**	−0.011	−2.55**
Central bank turnover	—	—	—	—
Terms of trade	−0.004	−0.32	−0.004	−0.32
Government balance	−0.063	−0.87	−0.063	−0.87
Number of observations, R^2	758	0.61	758	0.61
Very open economies[d]				
Constant	0.044	3.76***	0.044	3.76***
Pegged regimes	0.018	2.41**	0.002	0.27
Floating regimes	0.100	8.04***	0.036	4.14***
Money growth	1.197	7.54***	1.197	7.54***
GDP growth	−0.737	−2.80***	−0.737	−2.80***
Trade openness	−0.012	−1.76*	−0.012	−1.76*
Central bank turnover	0.051	2.80	0.051	2.80
Terms of trade	0.007	0.79	0.007	0.79
Government balance	−0.044	−0.46	−0.044	−0.46
Number of observations, R^2	432	0.61	432	0.61

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of exchange rate regime on inflation, plus indirect effect through money growth difference, given by $\beta_{Peg} + \beta_{Mon}(\Delta m_{Peg} - \Delta m_{Cbd})$ and $\beta_{Flt} + \beta_{Mon}(\Delta m_{Flt} - \Delta m_{Cbd})$ for pegged and floating regimes, respectively.
[b] Inflation below 10 percent per year.
[c] Central bank turnover rate below 5 percent per year.
[d] Sum of exports plus imports greater than 100 percent of GDP.

The overall effects are robust across income groups, though the decomposition into confidence and discipline effects differs. For the subsample of upper- and upper-middle-income countries, currency boards are associated with 5 percent per year lower inflation than other pegged regimes and 13 percent per year lower inflation than floats—with the bulk of the difference coming from the confidence effects of adopting a currency board rather than from significantly lower money growth rates. Among the lower-income countries, by contrast, although the overall inflation differentials between currency boards and other regimes are somewhat larger—7 percent per year and 18 percent per year, respectively—these are driven almost entirely by the greater monetary discipline under currency board regimes.

Statistically significant differentials in inflation performance across exchange rate regimes are apparent even among countries with low inflation rates (i.e., below 10 percent per year). Since this is a subset of countries that *could* all have a currency board, the finding that those low-inflation countries that did in fact opt for a CBA experienced lower inflation than those low-inflation countries opting for other regimes suggests that the superior performance of currency boards is not a case of simple reverse causality.

Not surprisingly, once the focus is further restricted to open economies with full capital account mobility and independent central banks, the confidence effect of the currency board relative to other pegged exchange rate regimes becomes relatively unimportant (and, in some cases, statistically insignificant); see box 6.1. Overall inflation differentials remain, however, and both the confidence and the discipline effects relative to floating exchange rate regimes are statistically and economically significant.

6.3 Robustness Tests

How robust are these findings? In this section we undertake three main robustness checks. First, we exclude the first few years following the adoption of the regime in case there is "contamination" across regimes. Second, we reestimate the inflation regression including country fixed effects. Third, we develop a simultaneous equation model to take account of the possible endogeneity of the regime choice.

As an initial check against outliers, we begin by excluding the bottom 10 percent of the observations ranked by the country's inflation rate; doing so makes virtually no difference to the results. Excluding

Box 6.1
Credibility effects versus relative price adjustments

The theoretical model developed in chapter 3 implies that inflation should be lower under pegged exchange rate regimes—a fortiori under hard pegs—than under more flexible regimes. Underlying this result is the assumption that inflation is "always and everywhere" a monetary phenomenon. While this may be true over the long run, it need not hold in the short run, where cost-push and relative price adjustments may also be at play. In particular, the Harrod-Balassa-Samuelson effect implies that faster relative productivity growth in the tradables sector leads to an increase in the relative price of nontradables.[a] If the nominal exchange rate is fixed, this can only come about through nontradable price inflation.

Is this effect empirically important? A comparison between Hong Kong (with its currency board) and Singapore (which had a peg from 1973 to 1987 and a managed float thereafter) provides a natural experiment. Both are relatively small, service-oriented, open, and fast-growing economies. Contrasting Hong Kong and Singapore thus allows for a side-by-side, albeit heuristic, comparison between the effects of generally prudent policies under a currency board and the easier relative price adjustment under more flexible regimes.

The Harrod-Balassa-Samuelson effect indeed seems to dominate. As figure 6B.1 shows, Hong Kong's inflation was consistently higher than Singapore's for most of the 1980s and 1990s up until the Asian crisis. The finding is consistent with Devereux (2003), who assumes that Hong Kong and Singapore have the same degree of credibility in their monetary policies and then uses a dynamic structural equilibrium model to show how Singapore should have lower inflation because the flexible exchange rate regime allows the relative price of nontradables to adjust through a nominal appreciation rather than by inflation.

The result is also consistent with our own empirical findings, that when countries already have a high degree of policy credibility, the marginal gain from a currency board is relatively small. It follows that inflation in these cases would be determined by other factors, including relative price adjustments in the economy.

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[a] The result follows from the equality of nominal wages across sectors. Since wages equal the value of the marginal product of labor, a rise in the relative productivity of the tradables sector leads to an increase in the relative price of nontradables. Finally, by purchasing power parity (for tradable goods), under a fixed exchange rate, the relative price can adjust only through an increase in nontradables prices, resulting in inflation. Under a flexible exchange rate, the nominal exchange rate can appreciate instead.

$$P^T MPL^T = w = P^N MPL^N \Rightarrow MPL^T/MPL^N = P^N/P^T = P^N/eP^{T^*}.$$

Box 6.1
(continued)

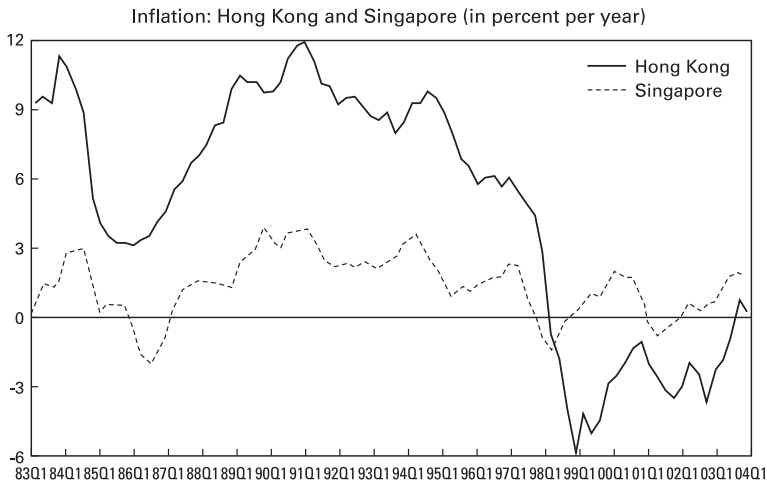


Figure 6B.1
Inflation: Hong Kong and Singapore (in percent per year)

the top 10 percent of observations in terms of inflation does make a quantitative—though not a qualitative—difference, with the inflation differential in favor of currency boards against other pegged regimes falling to 5 percent per year (compared to 8 percent per year in the full sample) and against floating regimes to 8 percent per year (compared to 21 percent per year in the full sample). Both coefficients remain highly statistically significant, however, with the smaller difference in performance across regimes simply reflecting the exclusion of the high-inflation observations under other pegged, and especially under floating regimes.

6.3.1 Cross-Regime Contamination

If a soft peg or a currency board allows the government to cheat—delivering apparently good performance while running inconsistent macroeconomic policies (Tornell and Velasco 1995, 2000)—then the spike in inflation when the peg collapses would be incorrectly blamed on the subsequent float. To control for this potential contamination, we drop the initial years following the adoption of a new regime. This sample restriction also throws a light on whether the association

between currency boards (and, to a lesser degree, softer pegs) and low inflation is just an initial stabilization phenomenon or whether it also describes the longer-term performance.

Table 6.2 reports the inflation regression dropping the first three years following the adoption of a new regime. The exclusion leads to a modest decrease in the overall inflation differentials—7.6 percent per year instead of 8.3 percent per year vis-à-vis other pegged regimes, and 16.5 percent per year instead of 21.6 percent per year vis-à-vis floating regimes. The differences, however, remain both statistically and economically significant. Interestingly, the proportional contribution of the confidence effect to the overall inflation differential is smaller (albeit still significant), suggesting that the confidence effect is particularly important during the initial stabilization phase when the adoption of a currency board gives a clear signal of a break from past policies and leads to a rapid increase in money demand reducing inflation for a given monetary expansion. As a further robustness test, the bottom panel of table 6.2 reports the regression once the exclusion is increased to the first five years following the change in regime. The results are very similar, suggesting that they are indeed capturing the "steady-state" properties of the exchange rate regimes.

6.3.2 Country Fixed Effects

The results presented here are based on a panel regression, which reflects both the time-series and the cross-sectional dimensions of the dataset. A time-series study suffers from the potential drawback that there may be events—such as global oil price shocks or the worldwide movement toward lower inflation in the late 1980s and 1990s—that are temporally correlated with the adoption of an exchange rate regime, leading to a spurious correlation between inflation performance and the exchange rate regime. To take account of this possibility, the panel regressions reported earlier always include annual dummies.

A cross-sectional study suffers from the analogous problem that there could be country-specific factors driving inflation performance that is incorrectly attributed to the country's exchange rate regime. Corresponding to our inclusion of annual dummies, table 6.3 reports the results when the regression also includes country dummies (fixed effects), which control for any country-specific factors in the inflation performance. The inclusion of country dummies means that the results are driven entirely by the time-series variation in the data—that is, the change in inflation if and when a country switches regimes. Since

Table 6.2
Inflation performance of alternative regimes relative to currency boards
$\pi = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{Mon} \Delta m + \beta_4 \Delta GDP + \beta_5 Open + \beta_6 CBTurn + \beta_7 \Delta TT + \beta_8 Fisc.\ Bal. + \varepsilon$
(only coefficients on regime dummies reported)

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
Dropping the first three years following change of regime				
Full sample				
Constant	0.039	2.91***	0.039	2.91***
Pegged regimes	0.076	7.21***	0.020	3.07***
Floating regimes	0.165	10.43***	0.057	8.45***
Number of observations, R^2	1800	0.59	1800	0.59
Upper- and upper-middle-income countries				
Constant	0.012	0.68	0.012	0.68
Pegged regimes	0.032	2.76***	0.019	1.97**
Floating regimes	0.082	5.30***	0.054	5.13***
Number of observations, R^2	867	0.65	867	0.65
Lower- and lower-middle-income countries				
Constant	0.053	1.72*	0.053	1.72*
Pegged regimes	0.099	7.38***	0.009	0.80
Floating regimes	0.221	10.89***	0.027	1.77*
Number of observations, R^2	933	0.53	933	0.53
Dropping the first five years following change of regime				
Full sample				
Constant	0.038	2.87***	0.038	2.87***
Pegged regimes	0.081	5.51***	0.015	2.02**
Floating regimes	0.170	7.70***	0.053	6.94***
Number of observations, R^2	1548	0.58	1548	0.58
Upper- and upper-middle-income countries				
Constant	0.020	1.15	0.020	1.15
Pegged regimes	0.029	3.08***	0.013	1.58
Floating regimes	0.078	6.48***	0.046	5.41***
Number of observations, R^2	762	0.68	762	0.68
Lower- and lower-middle-income countries				
Constant	0.053	1.70*	0.053	1.70*
Pegged regimes	0.108	6.55***	0.006	0.50
Floating regimes	0.227	8.92***	0.017	1.04
Number of observations, R^2	786	0.53	786	0.53

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of exchange rate regime on inflation, plus indirect effect through money growth growth, given by $\beta_{Peg} + \beta_{Mon}(\Delta m_{Peg} - \Delta m_{Cbd})$ and $\beta_{Flt} + \beta_{Mon}(\Delta m_{Flt} - \Delta m_{Cbd})$ for pegged and floating regimes, respectively.

Table 6.3
Inflation performance of alternative regimes relative to currency boards including country fixed effects
$\pi = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{Mon} \Delta m + \beta_4 \Delta GDP + \beta_5 Open + \beta_6 CBTurn + \beta_7 \Delta TT + \beta_8 Fisc.\ Bal. + \varepsilon$

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
Full sample				
Constant	0.126	1.08	0.126	1.08
Pegged regimes	0.459	8.05***	0.438	8.51***
Floating regimes	0.486	9.43***	0.477	9.45***
Money growth	0.287	0.90	0.287	0.90
GDP growth	−0.826	−3.37***	−0.826	−3.37***
Trade openness	0.055	3.12***	0.055	3.12***
Central bank turnover	0.019	1.63	0.019	1.63
Terms of trade	0.006	0.76	0.006	0.76
Government balance	−0.142	−1.97**	−0.142	−1.97**
Number of observations, R^2	2189	0.65	2189	0.65

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of exchange rate regime on inflation, plus indirect effect through money growth growth, given by $\beta_{Peg} + \beta_{Mon}(\Delta m_{Peg} - \Delta m_{Cbd})$ and $\beta_{Flt} + \beta_{Mon}(\Delta m_{Flt} - \Delta m_{Cbd})$ for pegged and floating regimes, respectively.

many of the countries that adopted currency board arrangements saw dramatic declines (compared to their previous performance), it is unsurprising that the inflation differential between currency boards and other regimes increases substantially to 46 percent per year relative to other pegs (and 48 percent per year relative to floating regimes).

6.3.3 Simultaneous Equation Framework

How should one interpret the seemingly robust relationship between currency boards and low inflation? Do currency boards lead to lower inflation? Or are countries with low inflation rates simply more likely to adopt—and maintain—a currency board arrangement? To address this question, we develop a simultaneous equation model. The first stage of the model is a probit modeling the country's proclivity toward a currency board relative to some other specified alternative regime. The fitted probability from the first-stage probit is then used as the dummy variable to capture the exchange rate regime in the inflation

regression; the standard errors for the second-stage regression are calculated following Maddala 1989.

While, in principle, the nonlinearity of the probit is sufficient to identify the second-stage inflation regression, the econometric identification will be more compelling if there are variables that influence the choice of the exchange rate regime but do not enter the inflation regression directly. We use two such variables: country size (as captured by population), on grounds that larger countries are less likely to choose a currency board, and geographical concentration of exports (as captured by the share of total exports that go to the country's top three export markets), on grounds that a country is more likely to adopt a currency board when it has a highly concentrated export market.

How convincingly these variables solve the identification problem depends on the alternative regime under consideration. While they are probably effective in modeling the choice between a currency board and a floating regime, they are less likely to be able to differentiate between a currency board and a softer peg. With this limitation in mind, we consider three alternatives: a currency board versus either a soft peg or a float, a currency board versus a float, and a currency board versus a soft peg.

The top panel of table 6.4 reports the results of the first-stage probit where the alternative to the currency board is either a soft peg or a float. As expected, the smaller the country, or the more concentrated its exports, the greater the likelihood of a currency board. The other variables are included because they enter the second-stage inflation regression, but it is noteworthy that countries with low central bank independence (as captured by a high turnover rate of the governor) are less likely to have a currency board regime.

The second panel reports the second-stage inflation regression, using the fitted value for the currency board dummy, while the third panel reports OLS estimates for comparison. From the OLS estimates, currency boards are associated with 12 percent per year lower inflation than (the average of) other pegged or floating regimes (of which 6 percentage points derive from the confidence effect). Taking account of simultaneity bias, the 12 percent per year differential falls to 9 percent per year but remains statistically and economically significant (the confidence effect falls to 1.7 percent per year, and is no longer statistically significant). The coefficients on the other variables are generally similar across the OLS and 2SLS estimates, though with somewhat lower levels of statistical significance.

Table 6.4
Simultaneous equation framework: Currency board vs. other peg or float

	Choice of currency board vs. other peg or float	
	coef.	t-stat.
Constant	−2.09	−14.62***
Population size	−0.27	−4.86***
Export concentration	0.02	3.85***
Money growth	12.87	3.64***
GDP growth	2.65	0.52
Trade openness	−0.15	−0.75
Central bank turnover	−0.98	−2.74***
Terms of trade	0.04	0.12
Government balance	4.60	2.36**
Number of observations	2043	
Percent correctly predicted	97.3	

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
2SLS estimates				
Constant	0.007	0.55	0.007	0.21
Currency board	−0.091	−3.07***	−0.017	−1.29
Money growth	1.042	3.32***	1.042	3.32***
GDP growth	−1.083	−1.85*	−1.083	−1.85*
Trade openness	−0.036	−1.90*	−0.036	−1.90*
Central bank turnover	0.090	2.67***	0.090	2.67***
Terms of trade	0.011	0.23	0.011	0.23
Government balance	−0.090	−0.45	−0.090	−0.45
Number of observations, R^2	2043	0.19	2043	0.19
OLS estimates				
Constant	0.002	0.60	0.002	0.60
Currency board	−0.124	−12.92***	−0.060	−8.95***
Money growth	0.912	12.57***	0.912	12.57***
GDP growth	−1.069	−3.74***	−1.069	−3.74***
Trade openness	−0.044	−7.34***	−0.044	−7.34***
Central bank turnover	0.099	6.35***	0.099	6.35***
Terms of trade	0.010	0.59	0.010	0.59
Government balance	−0.144	−1.80*	−0.144	−1.80*
Number of observations, R^2	2043	0.18	2043	0.18

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of currency board on inflation, plus indirect effect through money growth, given by $\beta_{Cbd} + \beta_{Mon}(\Delta m_{Cbd} - \Delta m_{Other})$.

Table 6.5 repeats the same exercise, but now the alternative to a currency board is a floating regime. Again, a smaller country or one with more concentrated exports is more likely to adopt a currency board arrangement. The OLS estimates suggest a differential of 24 percent per year in the inflation performance of currency boards relative to floating regimes (of which 14 percentage points represent the confidence effect). But much of this difference comes from countries with high inflation being unable to maintain a currency board (and being forced to float, instead). Controlling for simultaneity bias consequently halves the differential to 12 percent per year (of which 2.5 percent results from the confidence effect of the currency board on money demand); the differential, however, remains statistically significant.

The corresponding comparison between currency board arrangements and other pegged exchange rate regimes yields a (statistically significant) differential in favor of currency boards of 3.6 percent per year—marginally *larger* than the OLS estimate of 3.3 percent per year, suggesting that simultaneity bias may be more problematic for simple pegs than for currency boards (i.e., the inflation performance under simple pegs may to a greater extent reflect the ability of countries with low inflation to maintain the peg than low inflation under a currency board reflects the ability of low-inflation countries to have currency boards).

Taken as a whole, the evidence suggests that the better inflation performance under currency board arrangements is indeed in part—but only in part—driven by the greater ability of low-inflation countries to maintain such a regime. Even taking account of simultaneity bias, however, the inflation differential in favor of currency boards compared to either floats or other pegs remains economically and statistically significant.

6.4 Disinflation and Macroeconomic Stabilization

The results presented in sections 6.2 and 6.3 pertain to the average inflation performance under alternative exchange rate regimes. As such, they commingle periods of rising, steady, and falling inflation. But modern currency boards are often adopted explicitly as a disinflation device in a situation of impaired central bank credibility, be it because of a long history of failed stabilization attempts (e.g., Argentina) or because it has been newly (re)founded, as in many transition economies. How well do currency boards fare in this role? Do they succeed

Table 6.5
Simultaneous equation framework: Currency board vs. floating regime

	Choice of currency board vs. floating regime	
	coef.	t-stat.
Constant	−1.67	−6.34***
Population size	−0.79	−6.93***
Export concentration	0.04	4.44***
Money growth	21.21	5.57***
GDP growth	2.46	0.36
Trade openness	−2.10	−3.91***
Central bank turnover	−1.93	−3.55***
Terms of trade	−0.61	−1.02
Government balance	4.52	1.41
Number of observations	1107	
Percent correctly predicted	98.5	

	Unconditional on money growth[a]		Conditional on money growth	
	coef.	t-stat.	coef.	t-stat.
2SLS estimates				
Constant	0.008	0.25	0.008	0.25
Currency boards	−0.120	−3.99***	−0.025	−2.99***
Money growth	1.070	3.62***	1.070	3.62***
GDP growth	−1.690	−2.10**	−1.690	−2.10**
Trade openness	0.007	0.28	0.007	0.28
Central bank turnover	0.129	2.53**	0.129	2.53**
Terms of trade	−0.001	−0.01	−0.001	−0.01
Government balance	−0.404	−1.31	−0.404	−1.31
Number of observations, R^2	1107	0.29	1107	0.29
OLS estimates				
Constant	0.007	1.77*	0.007	1.77*
Currency boards	−0.235	−15.87***	−0.142	−13.77***
Money growth	1.047	14.51***	1.047	14.51***
GDP growth	−1.699	−3.98***	−1.699	−3.98***
Trade openness	0.007	0.96	0.007	0.96
Central bank turnover	0.130	5.37***	0.130	5.37***
Terms of trade	0.000	−0.01	0.000	−0.01
Government balance	−0.423	−2.74***	−0.423	−2.74***
Number of observations, R^2	1107	0.31	1107	0.31

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of currency board on inflation, plus indirect effect through money growth, given by $\beta_{Cbd} + \beta_{Mon}(\Delta m_{Cbd} - \Delta m_{Flt})$.

in lowering inflation? And does the disinflation come at the cost of lost competitiveness and slow export and output growth?

We consider three definitions of what constitutes a disinflation episode: an initially low inflation rate (below 20 percent per year) coupled with a decline of at least 5 percentage points over a two-year period; moderate initial inflation (between 20 and 50 percent per year) coupled with a decline of at least 10 percentage points over a two-year period; and an initially high inflation rate (above 50 percent per year) coupled with a decline of at least 20 percentage points over a two-year period.

We first explore whether these two-year disinflation periods are "successful" and "durable." Specifically, for the sample of stabilization episodes over the two-year period, we ask in how many cases inflation in the three years after the stabilization remains below its pre-stabilization rate (our definition of a "successful" stabilization) and in how many cases the inflation remains below its initial post-stabilization rate over the following three years (our definition of a "durable" disinflation.) Table 6.6 reports the results. Across exchange rate regimes, for countries starting with inflation rates below 20 percent per year, 64 percent managed to stabilize successfully but only 18 percent achieved durable declines in inflation. But success rates were considerably higher for countries attempting to disinflate under a currency board regime: all of the countries managed to keep inflation below the pre-stabilization rate and half managed to keep inflation below the initial post-stabilization inflation rate.

Likewise, of countries starting with moderate inflation rates (between 20 and 50 percent per year), 80 percent with currency board arrangements achieved durable disinflations—a significantly larger proportion than achieved by countries with other pegged (17 percent) or floating regimes (30 percent). Currency boards have also been significantly more successful in lowering inflation in countries that start with high inflation.

As discussed earlier, currency boards help achieve lower inflation by imposing monetary discipline and instilling confidence in the domestic currency. Do these effects also hold specifically during disinflation episodes? Table 6.7 repeats the base inflation regressions, restricting the sample to disinflation episodes starting from low, moderate, or high inflation rates. From the table, inflation is 3.5–5 percent per year lower under a currency board for countries starting their disinflation from inflation rates below 20 percent per year, 2–7 percent per year lower for countries starting from moderate inflation rates, and 15–30 percent per

Table 6.6
Disinflation episodes under alternative exchange rate regimes

	Total	Currency boards	Pegged regimes	Floating regimes
Inflation below 20 percent per year in year $t_0 - 2$, at least 5 percentage point decline between years $t_0 - 2$ and t_0				
Number	334	12	180	82
Proportion of total	100.0	3.6	53.9	24.6
Proportion of disinflation attempts with				
Inflation in $t_0 + 1$ below inflation in $t_0 - 2$	87.1	100.0	87.8	85.4
Inflation in $t_0 + 2$ below inflation in $t_0 - 2$	70.1	100.0	81.7	87.8
Inflation in $t_0 + 3$ below inflation in $t_0 - 2$[a,c]	64.4	100.0***	74.4	80.5
Inflation in $t_0 + 1$ below inflation in t_0	37.7	58.3	40.6	53.7
Inflation in $t_0 + 2$ below inflation in t_0	23.7	50.0	21.7	39.0
Inflation in $t_0 + 3$ below inflation in t_0[b,c]	18.0	50.0***	16.7***	26.8
Inflation above 20 percent and below 50 percent per year in year $t_0 - 2$, at least 10 percentage point decline between years $t_0 - 2$ and t_0				
Number	226	5	117	103
Proportion of total	100.0	2.2	51.8	45.6
Proportion of disinflation attempts with				
Inflation in $t_0 + 1$ below inflation in $t_0 - 2$	96.9	100.0	95.7	98.1
Inflation in $t_0 + 2$ below inflation in $t_0 - 2$	87.2	100.0	87.2	86.4
Inflation in $t_0 + 3$ below inflation in $t_0 - 2$[a,c]	81.0	100.0***	82.9	77.7
Inflation in $t_0 + 1$ below inflation in t_0	45.6	100.0	41.9	47.6
Inflation in $t_0 + 2$ below inflation in t_0	30.5	80.0	24.8	35.0
Inflation in $t_0 + 3$ below inflation in t_0[b,c]	24.3	80.0***	17.1	30.1
Inflation above 50 percent per year in year $t_0 - 2$, at least 20 percentage point decline between years $t_0 - 2$ and t_0				
Number	106	2	27	77
Proportion of total	100.0	1.9	25.5	72.6
Proportion of disinflation attempts with				
Inflation in $t_0 + 1$ below inflation in $t_0 - 2$	88.7	100.0	77.8	92.2
Inflation in $t_0 + 2$ below inflation in $t_0 - 2$	82.1	100.0	74.1	84.4
Inflation in $t_0 + 3$ below inflation in $t_0 - 2$[a,c]	75.5	100.0	74.1	75.3
Inflation in $t_0 + 1$ below inflation in t_0	46.2	100.0	40.7	46.8
Inflation in $t_0 + 2$ below inflation in t_0	36.8	100.0	33.3	36.4
Inflation in $t_0 + 3$ below inflation in t_0[b,c]	32.1	100.0**	33.3	29.9

[a] t_0 is the year of initial inflation decline; if inflation remains below its initial $(t_0 - 2)$ level for three years, this constitutes successful stabilization.
[b] t_0 is the year of initial inflation decline; if inflation remains below its level in year t_0, this constitutes durable disinflation.
[c] Asterisks denote statistically significant differences in proportions from floating regimes at the 10(*), 5(**), and 1(***) percent levels, respectively.

Table 6.7
Inflation regressions during disinflation episodes
$\pi = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{Mon}\Delta m + \beta_4\Delta GDP + \beta_5 Open + \beta_6 CBTurn + \beta_7\Delta TT + \beta_8 Fisc.\ Bal. + \varepsilon$

	Unconditional on money growth[a]		Conditional on money growth[b]	
	coef.	t-stat.	coef.	t-stat.
Inflation below 20 percent per year in year $t_0 - 2$, at least 5 percent decline between years $t_0 - 2$ and t_0				
Constant	0.014	1.17	0.014	1.17
Pegged regimes	0.036	4.77***	0.033	4.38***
Floating regimes	0.050	5.49***	0.043	5.15***
Number of observations, R^2	547	0.24	547	0.24
Inflation above 20 percent and below 50 percent per year in year $t_0 - 2$, at least 10 percent decline between years $t_0 - 2$ and t_0				
Constant	0.038	1.36	0.038	1.36
Pegged regimes	0.021	1.63	0.032	2.57**
Floating regimes	0.076	5.65***	0.068	5.32***
Number of observations, R^2	763	0.18	763	0.18
Inflation above 50 percent per year in year $t_0 - 2$, at least 20 percent decline between years $t_0 - 2$ and t_0				
Constant	0.061	0.93	0.061	0.93
Pegged regimes	0.147	5.70***	0.051	3.13***
Floating regimes	0.300	7.61***	0.144	7.67***
Number of observations, R^2	891	0.14	891	0.14

Asterisks denote statistical significance at the 10 percent (*), 5 percent (**), and 1 percent (***) levels, respectively.
[a] Direct effect of exchange rate regime on inflation, plus indirect effect through money growth, given by $\beta_{Peg} + \beta_{Mon}(\Delta m_{Peg} - \Delta m_{Cbd})$ and $\beta_{Flt} + \beta_{Mon}(\Delta m_{Flt} - \Delta m_{Cbd})$ for pegged and floating regimes, respectively.
[b] Direct effect of exchange rate regime on inflation, controlling for money growth given by β_{Peg} and β_{Flt} for pegged and floating regimes, respectively.

year lower for those starting from high inflation rates. As such, both greater monetary discipline and higher confidence contribute to more rapid disinflation under currency board regimes.

Yet at what cost does this success at disinflation come? A common concern is that adopting a currency board—while useful for bringing down inflation—leads to a sharp real exchange rate appreciation, stifling exports and output growth.[6] Figures 6.1 and 6.2 graph the behavior of key macroeconomic variables in disinflation episodes (for brevity, only those starting from moderate inflation rates are shown). From figure 6.1, it is hard to make a case that disinflation under a

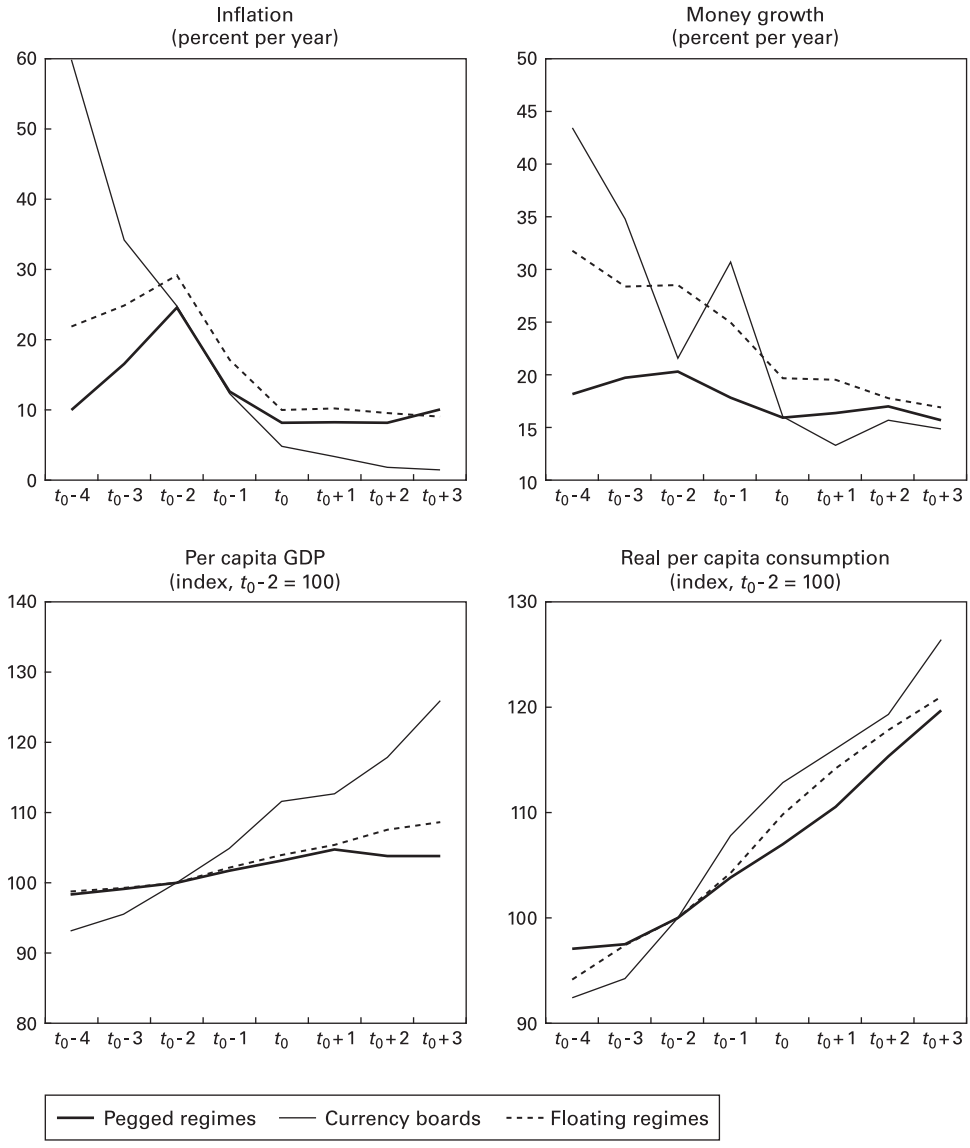


Figure 6.1
Macroeconomic performance during disinflation under alternative regimes (medians, in percent per year)

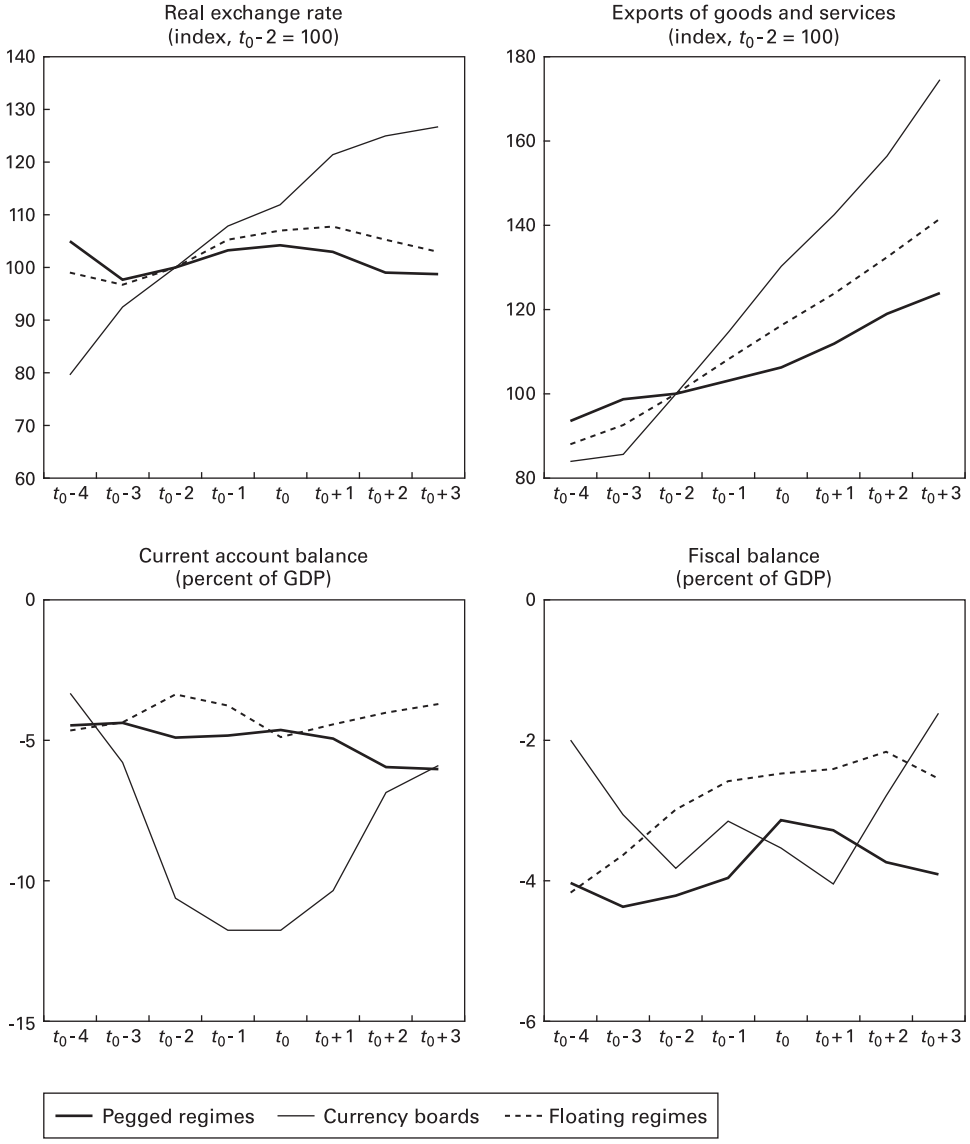


Figure 6.2
Macroeconomic performance during disinflation under alternative regimes (medians, in percent per year)

currency board is detrimental to growth: an index of per capita real GDP ($t_0 - 2 = 100$) grows by 25 percent by year $t_0 + 3$ under a currency board, compared to 9 percent under a float and 4 percent under a simple peg. From figure 6.2, disinflations under currency board arrangements are associated with considerably greater real exchange rate appreciations, but this does not seem to take a toll on export growth, which grows by 75 percent over the five-year period (compared to 25–40 percent under simple pegs or floating regimes, respectively). The real exchange rate appreciation and rapid growth in output and real consumption does lead to a significant widening of the current account deficit. At the end of the five-year period, the current account deficit under the currency board is no different from that under a simple peg, and some 2 percent of GDP larger than under a float.

6.5 Conclusions

We examined whether the stylized fact of lower inflation under currency boards compared to other regimes is a reflection of the currency board regime itself or is the result of other determinants of inflation or possible simultaneity bias.

The evidence suggests that the relationship between currency boards and good inflation performance is remarkably robust and appears to be causal. Controlling for other determinants of inflation, we find that currency boards are associated with 8–20 percentage points per year lower inflation than simple pegs or floating regimes, reflecting both tighter monetary discipline and greater confidence in the currency. The results are largely robust to controlling for possible cross-regime contamination, country fixed effects, and simultaneity bias.

The findings also suggest that currency boards may be useful disinflation tools, delivering greater rates of success than alternatives. Moreover, this success does not seem to come at the cost of lower export or growth performance. Of course, we have only examined short-run growth performance under currency boards in the aftermath of macroeconomic stabilization. Whether currency boards stifle exports and growth over the longer run is a separate question, to which we turn next.

7 Output Growth and Trade Performance

7.1 Introduction

The stylized facts presented in chapter 5 suggest that countries with currency boards enjoy both lower inflation—consistent with the theoretical model—and faster output growth, a finding less strongly rooted in economic theory. Following the more detailed examination of the inflation results in the last chapter, we now turn to the growth and volatility results, focusing on three specific questions. First, do currency boards result in slower output growth, controlling for other potential determinants? Second, does competitiveness and export performance suffer under currency boards? Third, does the adoption of a CBA with the implied loss of the exchange rate as an adjustment tool lead to more volatile output growth?

We employ the same methodology as in the last chapter, first developing a baseline model to examine whether the exchange rate regime is a significant determinant of growth once other variables suggested by the empirical growth literature are included, and then subjecting the results to various robustness tests. Section 7.2 presents the baseline growth regression and robustness tests. Section 7.3 examines whether output or growth is more volatile under currency boards (or other pegged regimes) relative to floats. Section 7.4 considers export performance and the behavior of the current account balance. Section 7.5 concludes.

7.2 Real Economic Growth under Alternative Regimes

7.2.1 Baseline Regression

The extensive empirical and theoretical literatures exploring determinants of economic growth have yielded a core set of robust determinants. The exchange rate regime may either act as an additional

direct determinant of growth—though theory provides little basis for such a link—or may exert an indirect influence through other determinants. The most obvious candidate is the investment ratio, which is both a sturdy determinant of growth and, as noted in chapter 5, varies significantly across exchange rate regimes.

In what follows, we separately estimate the direct and total effect of the exchange rate regime on growth. The direct effect is provided by the coefficient on the regime in a regression controlling for, among other variables, investment. Such a direct effect—roughly measuring the impact of the regime on total factor productivity—might, for instance, arise if a fixed exchange rate regime prevents relative price adjustments, leading to inefficient resource allocation reducing growth. The total effect includes both the direct effect and any indirect influence the exchange rate regime exerts on growth through investment.

Our core regression equation aims to replicate to the extent possible popular formulations used in the empirical growth literature (Durlauf, Johnson, and Temple 2005). The equation allows for the convergence effects strongly supported by the literature by including the log of the ratio of the per capita GDP of the country to the per capita GDP of the United States (both in 1970, and measured in international prices) (y_0/y_0^{US}). Factor accumulation—likewise robustly associated with growth in many cross-country studies—is controlled for by the ratio of investment to GDP $(IGDP)$, by the average number of years of schooling of the population (Sch), and by population growth (ΔPop) to capture nonneutrality. Additional controls include the openness to trade $(Open)$ (Romer 1983), a scale variable (population size, $log(Pop)$), and a proxy for the size of government, the tax/GDP ratio $(TaxGDP)$.

One important difference between the exercise here and most cross-country growth models is that the dependent variable is the annual (per capita) growth rate rather than a five- or ten-year average. This is necessary since the exchange rate regime can change annually. It implies that less of the variation in the dependent variable is likely to be captured by explanatory variables than in the typical cross-country growth model. To allow for shorter-term shocks, we add the budget balance/GDP ratio $(Fisc.\ Bal.)$ (averaged over the previous three years to reduce problems of endogeneity and cyclical dependency) as well as terms of trade shocks (ΔTT). Finally, we include annual dummies to allow for global effects and the regime dummies. The estimated regression for per capita real GDP growth (Δy^{PC}) is thus given by

$$\Delta y^{PC} = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{IGDP} IGDP + \beta_4 Open + \beta_5 \Delta TT + \beta_6 Sch + \beta_7 TaxGDP + \beta_8 Fisc.\ Bal. + \beta_9 (y_0 / y_0^{US}) + \beta_{10} \Delta Pop + \beta_{11} \log(Pop) + \varepsilon. \quad (1)$$

Relative to pegs, the direct effect of the currency board (again the excluded category) is given by the coefficient β_{Peg}, while the total effect (including through investment) is given by $\beta_{Peg} + \beta_{IGDP}(\overline{IGDP}_{Peg} - \overline{IGDP}_{Cbd})$ and analogously for floats.

Table 7.1 reports the coefficient estimates. Investment and trade openness are associated with faster real GDP growth as are country size and better fiscal discipline (as captured by the surplus on the general government balance). Faster population growth and a higher initial level of income are associated with slower growth, consistent with cross-country income convergence. Turning to the regime effects, we note that the point estimates for both the pegged exchange rate and the floating exchange rate dummies are negative but statistically insignificant.

Splitting the sample according to the country's stage of economic development, however, shows a substantial difference in growth performance under different regimes. Specifically, low- and lower-middle-income countries with currency boards grew by 4.2 percent per year faster than countries with either floating exchange rates or some other form of pegged exchange rate regime—a difference that is both economically and statistically very significant. Nearly all of this difference comes from the effect on total factor productivity as the conditional (on investment) and unconditional coefficients are very close. The finding is consistent with a sharp (and temporary) increase in capacity utilization because the adoption of a CBA—often in the midst of economic crisis—provides stability, a point to which we return later.

7.2.2 Robustness Tests

Our finding that low- and lower-middle-income countries with currency boards grew 4 percent per year faster than countries in the same income groups with other regimes is surprising and raises the possibility that some other factors may be at work.

We first examine the possibility of legacy effects across regimes by dropping the first three years following the adoption of a new exchange rate regime (table 7.2). Overall results are unaffected, while the

Table 7.1
Per capita GDP growth under alternative regimes (relative to currency boards)
$\Delta y^{PC} = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{IGDP} IGDP + \beta_{Open} Open + \beta_5 \Delta TT + \beta_6 School + \beta_7 TaxGDP + \beta_8 Fisc.\ Bal. + \beta_9 (y_0 / y_0^{US}) + \beta_9 \Delta Pop + \beta_{10} \log(Pop) + \varepsilon$

	Unconditional on investment[a]		Conditional on investment	
All countries				
Constant	0.011	1.42	0.011	1.42
Pegged regimes	−0.005	−0.66	−0.003	−0.43
Floating regimes	−0.004	−0.51	−0.002	−0.30
Investment	0.042	1.97**	0.042	1.97**
Openness	0.010	3.87***	0.010	3.87***
Terms-of-trade growth	0.001	0.20	0.001	0.20
Schooling	0.001	1.03	0.001	1.03
Tax rate	0.005	0.49	0.005	0.49
Government balance	0.042	1.88*	0.042	1.88*
Initial income	−0.012	−1.98**	−0.012	−1.98**
Population growth	−0.432	−3.50***	−0.432	−3.50***
Population size	0.002	2.73***	0.002	2.73***
Number of observations, R^2	1889	0.13	1889	0.13
Upper- and upper-middle-income countries				
Constant	0.004	0.44	0.004	0.44
Pegged regimes	−0.001	−0.07	−0.001	−0.11
Floating regimes	0.007	0.79	0.006	0.72
Investment	−0.015	−0.44	−0.015	−0.44
Openness	0.011	3.99***	0.011	3.99***
Terms-of-trade growth	0.004	0.29	0.004	0.29
Schooling	0.002	2.50**	0.002	2.50**
Tax rate	0.005	0.47	0.005	0.47
Government balance	0.020	0.71	0.020	0.71
Initial income	−0.024	−3.55***	−0.024	−3.55***
Population growth	−0.134	−0.77	−0.134	−0.77
Population size	−0.001	−1.17	−0.001	−1.17
Number of observations, R^2	859	0.23	859	0.23
Lower- and lower-middle-income countries				
Constant	0.044	2.71***	0.044	2.71***
Pegged regimes	−0.042	−2.56**	−0.038	−2.34**
Floating regimes	−0.042	−2.49**	−0.039	−2.33**
Investment	0.087	2.73***	0.087	2.73***
Openness	0.012	1.64	0.012	1.64
Terms-of-trade growth	0.002	0.30	0.002	0.30
Schooling	−0.001	−0.46	−0.001	−0.46

Table 7.1
(continued)

	Unconditional on investment[a]		Conditional on investment	
Tax rate	−0.042	−1.68*	−0.042	−1.68*
Government balance	0.035	1.02	0.035	1.02
Initial income	−0.035	−1.37	−0.035	−1.37
Population growth	−0.262	−1.49	−0.262	−1.49
Population size	0.005	3.42***	0.005	3.42***
Number of observations, R^2	1030	0.11	1030	0.11

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.

[a] Direct effect of the exchange rate regime on growth plus indirect effect through investment, given by $\beta_{Peg} + \beta_{IGDP}(IGDP_{Peg} - IGDP_{Cbd})$ and $\beta_{Flt} + \beta_{IGDP}(IGDP_{Flt} - IGDP_{Cbd})$ for pegged and floating regimes, respectively.

growth differential in favor of currency boards for lower-income countries actually increases to 5.2 percent per year relative to other pegs and 5.5 percent per year relative to floating regimes.

Second, we examine whether the growth bonus reflects a temporary rebound effect of countries having adopted boards during a period of macroeconomic turbulence by adding the level of the country's income (relative to the United States, in international prices) in the year prior to the adoption of a new exchange rate regime. While this variable has the expected negative coefficient (a country that has been performing poorly at the time a new regime is adopted will tend to grow faster, ceteris paribus), it leaves the coefficients on the regime dummies virtually identical (table 7.2, bottom panel). Alternatively, we include the average growth rate in the three or five years prior to the adoption of the regime as the "bounce-back" variable. The variable does not enter the regression with a significant coefficient and also leaves the regime coefficients unaffected.

Including country fixed effects does alter the results. While countries with currency boards continue to perform no worse than countries with other regimes, the coefficients on the explanatory variables become insignificant, and there is no longer a significant positive growth effect associated with currency boards (table 7.3).

The final robustness test concerns possible simultaneity bias. We again use a simultaneous equation framework with country size and geographical concentration of exports as instruments. Taking account of endogeneity yields a marginally negative coefficient on the fitted

Table 7.2
Per capita GDP growth under alternative regimes (relative to currency boards) robustness tests

$$\Delta y^{PC} = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{IGDP}IGDP + \beta_{Open}Open + \beta_5\Delta TT + \beta_6 School + \beta_7 TaxGDP + \beta_8 Fisc.\ Bal. + \beta_9(y_0/y_0^{US}) + \beta_9\Delta Pop + \beta_{10}\log(Pop) + \varepsilon$$

	Unconditional on investment		Conditional on investment	
Dropping first three years following change of regime				
All countries				
Constant	−0.001	−0.08	−0.001	−0.08
Pegged regimes	0.006	0.63	0.007	0.79
Floating regimes	0.007	0.81	0.009	1.00
Number of observations, R^2	1604	0.13	1604	0.13
Upper- and upper-middle-income countries				
Constant	−0.007	−0.67	−0.007	−0.67
Pegged regimes	0.010	0.94	0.009	0.88
Floating regimes	0.018	1.70*	0.017	1.67*
Number of observations, R^2	745	0.23	745	0.23
Lower- and lower-middle-income countries				
Constant	0.055	3.47***	0.055	3.47***
Pegged regimes	−0.052	−3.26***	−0.050	−3.13***
Floating regimes	−0.055	−3.18***	−0.051	−2.99***
Number of observations, R^2	859	0.12	859	0.12
Including initial income at time of regime adoption				
All countries				
Constant	0.011	1.36	0.011	1.36
Pegged regimes	−0.005	−0.67	−0.003	−0.43
Floating regimes	−0.004	−0.53	−0.002	−0.30
Number of observations, R^2	1889	0.13	1889	0.13
Upper- and upper-middle-income countries				
Constant	0.002	0.18	0.002	0.18
Pegged regimes	0.001	0.14	0.001	0.07
Floating regimes	0.009	1.07	0.008	0.96
Number of observations, R^2	859	0.25	859	0.25
Lower- and lower-middle-income countries				
Constant	0.044	2.65***	0.044	2.65***
Pegged regimes	−0.042	−2.53**	−0.038	−2.31**
Floating regimes	−0.043	−2.49**	−0.040	−2.33**
Number of observations, R^2	1030	0.11	1030	0.11

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.

[a] Direct effect of exchange rate regime on growth plus indirect effect through investment, given by $\beta_{Peg} + \beta_{IGDP}(IGDP_{Peg} - IGDP_{Cbd})$ and $\beta_{Flt} + \beta_{IGDP}(IGDP_{Flt} - IGDP_{Cbd})$ for pegged and floating regimes, respectively.

Table 7.3
Per capita GDP growth under alternative regimes (relative to currency boards) (including country fixed effects)

$$\Delta y^{PC} = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{IGDP}IGDP + \beta_{Open}Open + \beta_5\Delta TT + \beta_6 School + \beta_7 TaxGDP + \beta_8 Fisc.\ Bal. + \beta_9(y_0/y_0^{US}) + \beta_9\Delta Pop + \beta_{10}\log(Pop) + Fixed\ effects + \varepsilon$$

	Unconditional on investment[a]		Conditional on investment	
All countries				
Constant	0.001	0.04	0.001	0.04
Pegged	−0.019	−1.05	−0.022	−1.19
Floating	−0.014	−0.80	−0.017	−0.95
Investment	−0.066	−1.98**	−0.066	−1.98**
Openness	0.030	3.30***	0.030	3.30***
Terms-of-trade growth	−0.007	−0.90	−0.007	−0.90
Schooling	−0.002	−0.97	−0.002	−0.97
Tax rate	−0.039	−1.39	−0.039	−1.39
Government balance	0.001	0.02	0.001	0.02
Initial income	0.240	0.27	0.240	0.27
Population growth	0.107	0.59	0.107	0.59
Population size	−0.001	−0.11	−0.001	−0.11
Number of observations, R^2	1806	0.27	1806	0.27
Upper- and upper-middle-income countries				
Constant	1.428	1.26	1.428	1.26
Pegged	−0.015	−0.73	−0.026	−1.28
Floating	−0.009	−0.45	−0.015	−0.73
Investment	−0.251	−4.30***	−0.251	−4.30***
Openness	0.061	4.18***	0.061	4.18***
Terms-of-trade growth	−0.008	−0.48	−0.008	−0.48
Schooling	−0.004	−1.72*	−0.004	−1.72*
Tax rate	−0.077	−2.01**	−0.077	−2.01**
Government balance	−0.013	−0.34	−0.013	−0.34
Initial income	4.058	1.28	4.058	1.28
Population growth	0.100	0.40	0.100	0.40
Population size	−0.040	−1.79*	−0.040	−1.79*
Number of observations, R^2	829	0.40	829	0.40
Lower- and lower-middle-income countries				
Constant	0.046	1.49	0.046	1.49
Pegged	0.005	0.04	0.005	0.04
Floating	0.003	0.03	0.003	0.03
Investment	0.001	0.02	0.001	0.02
Openness	0.009	0.76	0.009	0.76
Terms-of-trade growth	−0.007	−0.91	−0.007	−0.91

Table 7.3
(continued)

	Unconditional on investment[a]		Conditional on investment	
Schooling	−0.001	−0.30	−0.001	−0.30
Tax rate	−0.029	−0.68	−0.029	−0.68
Government balance	0.009	0.17	0.009	0.17
Initial income	−0.395	−0.53	−0.395	−0.53
Population growth	0.112	0.47	0.112	0.47
Population size	0.011	0.36	0.011	0.36
Number of observations, R^2	977	0.22	977	0.22

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of the exchange rate regime on growth plus indirect effect through investment, given by $\beta_{Peg} + \beta_{IGDP}(IGDP_{Peg} - IGDP_{Cbd})$ and $\beta_{Flt} + \beta_{IGDP}(IGDP_{Flt} - IGDP_{Cbd})$ for pegged and floating regimes, respectively.

currency board dummy compared to other pegged regimes and floating regimes, but it is economically small (less than 0.3 percentage points per year) and statistically insignificant; for the low-income countries, the coefficient is positive but also very small and statistically insignificant.

In sum, there is some indication that growth was faster under currency board regimes, particularly for low-income countries. However, the lack of a compelling theoretical foundation for an effect of the nominal exchange rate regime on trend growth, the econometric fragility of the result, and the possibility that the growth bonus reflects a temporary rebound in capacity utilization following stabilization all caution against placing too much weight on this result, and in particular against inferring a causal link between the adoption of a CBA and trend growth. By the same token, however, the results provide no support for a growth penalty associated with the adoption of currency boards.

7.3 Output Volatility

Even if the nominal exchange rate regime does not have strong implications for the average rate of output growth, in the presence of nominal rigidities and real shocks, it may,—and the Mundell-Fleming model suggests it would—affect the *volatility* of output and of growth (box 7.1). To assess this possibility, tables 7.4 and 7.5 report regressions

Box 7.1
Output volatility and the exchange rate regime

Figure 7B.1 illustrates one possible mechanism whereby fixed exchange rates may be associated with greater output volatility. Given a production function $f_0(L)$, at the initial equilibrium the real wage $\overline{w}/(ep^*)_0$ equals the marginal product of labor at the full employment level L_0, yielding a level of output $Q_0 = f_0(L_0)$. Now consider a negative productivity shock. If nominal wages and prices are sticky, then—in response to a negative productivity shock that shifts the production function downward to $f_1(L)$—the real wage (in terms of traded goods) can only adjust through a depreciation of the nominal exchange rate. This depreciation, under a floating regime, would reduce the real wage to $\overline{w}/(ep^*)_1$, maintaining employment at L_0, and yielding a level of output $Q_1^{flt} = f_1(L_1^{flt}) = f_1(L_0)$. Under a pegged regime—whether a monetary union, currency board, or other form of peg (unless there is a devaluation)—the real wage remains at $\overline{w}/(ep^*)_0$, leading to a lower level of employment, L_1^{fix}, and a correspondingly lower level of output- $Q_1^{fix} = f_1(L_1^{fix}) < Q_1^{flt}$. The impact of a real shock on output is thus greater under a pegged regime when there are nominal rigidities. By the same token, the floating exchange rate does not *eliminate* the impact of the shock on output—it simply allows for part of the impact to be absorbed by prices (i.e., real wages) rather than by quantities (employment) alone.

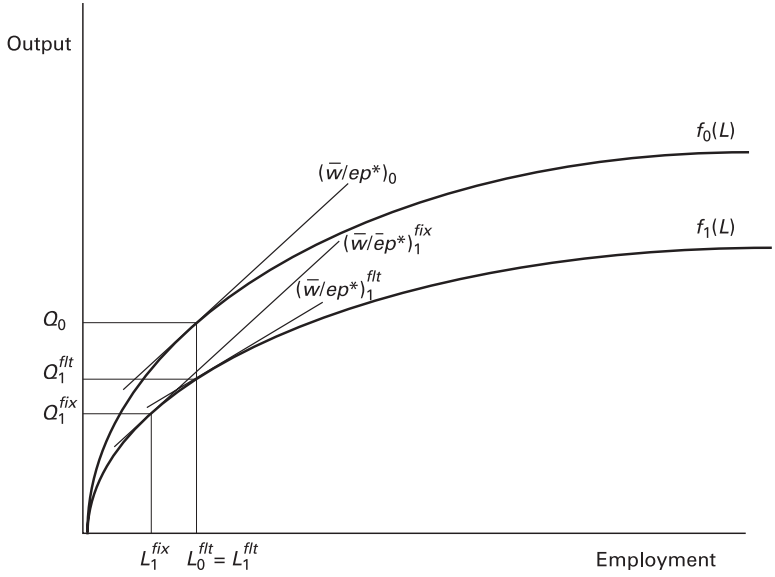


Figure 7B.1
Output volatility under pegged exchange rates and nominal rigidities

Table 7.4
Volatility of output growth under alternative regimes (relative to currency boards) upper- and upper-middle-income countries
$\sigma(y^{pc}) = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{IGDP}\sigma(IGDP) + \beta_{Open}Open + \beta_5\sigma(\Delta TT) + \beta_6 School + \beta_7 Fisc.\,Bal. + \beta_8 \log(Pop) + \varepsilon$

	Unconditional on investment volatility[a]		Conditional on investment volatility	
Three-year standard deviation of real GDP relative to HP filtered trend				
Constant	0.026	7.79***	0.026	7.79***
Pegged regimes	−0.009	−3.08***	−0.008	−2.88***
Floating regimes	−0.010	−3.42***	−0.008	−2.85***
Investment volatility	0.139	2.32**	0.139	2.32**
Openness	−0.002	−1.47	−0.002	−1.47
Terms-of-trade volatility	0.009	1.99**	0.009	1.99**
Schooling	−0.001	−5.08***	−0.001	−5.08***
Government balance	0.045	2.89***	0.045	2.89***
Population size	−0.001	−1.74*	−0.001	−1.74*
Number of observations, R^2	984	0.15	984	0.15
Three-year standard deviation of real GDP growth				
Constant	0.029	6.28***	0.029	6.28***
Pegged regimes	−0.008	−1.78*	−0.007	−1.63
Floating regimes	−0.010	−2.21**	−0.008	−1.81*
Investment volatility	0.159	1.87*	0.159	1.87*
Openness	0.001	0.72	0.001	0.72
Terms-of-trade volatility	0.011	1.64	0.011	1.64
Schooling	−0.001	−4.79***	−0.001	−4.79***
Government balance	0.050	3.17***	0.050	3.17***
Population size	0.000	−1.11	0.000	−1.11
Number of observations, R^2	984	0.16	984	0.16

[a] Direct effect of the exchange rate regime on output volatility plus indirect effect through investment, given by $\beta_{Peg} + \beta_{IGDP}(\sigma IGDP_{Peg} - \sigma IGDP_{Cbd})$ and $\beta_{Flt} + \beta_{IGDP}(\sigma IGDP_{Flt} - \sigma IGDP_{Cbd})$ for pegged and floating regimes, respectively.

using as the dependent variable the volatility of real GDP. This is measured as a centered, three-year standard deviation of the log of real GDP relative to its Hodrick-Prescott (HP) trend. Apart from the regime dummies, controls include the volatility of the investment ratio, the volatility of the terms of trade, as well as some of the other controls included in the growth regression.[1] Since the results are quite different between the upper-income and lower-income countries, they are presented separately.

Table 7.5
Volatility of output growth under alternative regimes (relative to currency boards) lower- and lower-middle-income countries
$\sigma(y^{pc}) = \beta_0 + \beta_{Peg}Peg + \beta_{Flt}Flt + \beta_{IGDP}\sigma(IGDP) + \beta_{Open}Open + \beta_5\sigma(\Delta TT) + \beta_6 School + \beta_7 Fisc.\,Bal. + \beta_8 \log(Pop) + \varepsilon$

	Unconditional on investment volatility[a]		Conditional on investment volatility	
Three-year standard deviation of real GDP relative to HP filtered trend				
Constant	0.001	0.14	0.001	0.14
Pegged regimes	0.022	6.46***	0.022	6.52***
Floating regimes	0.020	5.11***	0.020	5.13***
Investment volatility	0.021	0.41	0.021	0.41
Openness	−0.005	−1.67*	−0.005	−1.67*
Terms-of-trade volatility	0.000	0.02	0.000	0.02
Schooling	0.000	−1.20	0.000	−1.20
Government balance	−0.005	−0.32	−0.005	−0.32
Population size	−0.003	−4.45***	−0.003	−4.45***
Number of observations, R^2	1378	0.07	1378	0.07
Three-year standard deviation of real GDP growth				
Constant	0.012	1.07	0.012	1.07
Pegged regimes	0.011	0.97	0.012	1.03
Floating regimes	0.009	0.75	0.009	0.82
Investment volatility	0.130	1.74*	0.130	1.74*
Openness	−0.006	−2.05**	−0.006	−2.05**
Terms-of-trade volatility	0.002	0.63	0.002	0.63
Schooling	0.000	−0.69	0.000	−0.69
Government balance	−0.042	−2.36**	−0.042	−2.36**
Population size	−0.004	−5.43***	−0.004	−5.43***
Number of observations, R^2	1378	0.09	1378	0.09

[a] Direct effect of exchange rate regime on output volatility plus indirect effects through investment, given by $\beta_{Peg} + \beta_{IGDP}(\sigma IGDP_{Peg} - \sigma IGDP_{Cbd})$ and $\beta_{Flt} + \beta_{IGDP}(\sigma IGDP_{Flt} - \sigma IGDP_{Cbd})$ for pegged and floating regimes, respectively.

For the upper- (and upper-middle-) income countries (table 7.4), greater volatility of the investment ratio or of the terms of trade is associated with greater volatility of output (relative to it is HP-filtered trend). Openness to international trade, human capital, and larger population size (the latter two capturing more diversified economies) are associated with lower volatility. Larger fiscal balances are associated with greater output volatility. The effect may reflect the reduced scope for countercyclical policy in countries striving for fiscal discipline,

resulting in greater output volatility in the presence of nominal rigidities. The coefficients on the exchange rate regime dummies suggest that these nominal rigidities may indeed be important: countries with currency boards experience higher output volatility of about 1 percent per year relative to countries with either a floating exchange rate regime or soft pegs. The bottom panel of table 7.4 reports the regression results when the measure of output volatility is the three-year standard deviation of the annual real GDP growth rate (rather than the log level). The results are very similar (except that the terms-of-trade volatility now becomes significant), with countries under currency board arrangements experiencing higher real GDP growth volatility of about 1 percent per year.

Table 7.5 reports the corresponding coefficients for the lower- and lower-middle-income countries. Volatility of investment is again positively associated with volatility of output growth, while countries that are larger or more open experience less volatile output or output growth. In contrast to the upper-income and upper-middle-income countries, larger fiscal surpluses (or smaller deficits) are now associated with less volatile growth—possibly because, in many of these countries, fiscal policies are themselves a source of volatility. The sharpest contrast, however, concerns the ranking of exchange rate regimes—currency board arrangements are actually associated with lower volatility, significantly so when the deviation of output relative to its trend is considered.

The findings are intuitive. Upper-income countries are generally thought to suffer from more pronounced downward nominal price and, in particular, wage stickiness. Surrendering the nominal exchange rate as an adjustment tool in response to real shocks thus results in greater output volatility. In lower-income countries, wages and prices are less likely to be sticky and macroeconomic policies may themselves be a source of volatility. In such circumstances, the discipline of a currency board arrangement may help provide greater economic stability.

7.4 Exports and External Trade Performance

A common concern about currency boards is that, even if they are initially successful in reducing inflation from high levels, inflation will stabilize at levels above those of the anchor country, resulting in a trend of real exchange rate appreciation undermining the export sector.[2] Is this concern warranted? While several countries with currency boards experienced real exchange rate appreciations, the link to

eroding competitiveness is less clear—for two reasons. First, currency boards have often been adopted in the midst of high or hyperinflations, periods in which the real exchange rate is typically grossly undervalued, providing considerable room for a post-stabilization appreciation. Second, the growth and productivity recovery may itself raise the equilibrium real exchange rate, again providing some room for an appreciation without serious adverse effects on competitiveness.

Ultimately, it is only the empirical performance of exports that can resolve this issue. We regress the growth in exports (the volume of goods and nonfactor services exports) on the growth of the real exchange rate and the terms of trade (lagged, to avoid the obvious endogeneity), the change in world real GDP growth, and the two exchange rate dummies:

$$\Delta x = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{RER} \Delta RER + \beta_4 \Delta TT_{-1} + \beta_5 \Delta y^G. \quad (2)$$

Since the exchange rate regime is likely to affect the behavior of the real exchange rate, we allow for both direct effects of the exchange rate regime, given by β_{Peg}, and indirect effects operating through the real exchange rate, $\beta_{RER}(\overline{\Delta RER}_{Peg} - \overline{\Delta RER}_{Cbd})$ (and analogously for floating regimes relative to currency boards).

Table 7.6 reveals that faster growth of world income, improvements in the terms of trade, and real exchange rate depreciation are positively related to export growth. For upper- and upper-middle-income countries, neither exchange rate regime dummy is statistically significant. Controlling for the other determinants, the export performance under currency boards is thus neither better nor worse than under other exchange rate regimes. For the lower- and lower-middle-income countries, however, export growth is some 4 percent per year slower under currency boards (or other pegged regimes) relative to floats—mostly on account of the faster real exchange rate appreciation under these regimes.

As was the case with growth, exports were likely depressed in countries adopting currency boards in times of economic crisis, leading to the possibility of a "bounce-back" effect. If so, the lower measured growth may be an understatement of the total adverse effect of currency boards on export growth. To allow for this possibility, we augment the regression with the export-to-GDP ratio relative to its predicted value based on a standard cross-country openness regression.[3] While this variable enters the regression with the expected negative sign and is statistically significant, it does not alter the results. For upper-income countries, the regime does not seem to be robustly

Table 7.6
Export growth under alternative regimes (relative to currency boards)
$\Delta x = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{RER} \Delta RER + \beta_4 \Delta y^G + \beta_5 \Delta TT(-1) + \varepsilon$

	Unconditional on real exchange rate		Conditional on real exchange rate	
All countries				
Constant	0.052	4.20***	0.052	4.20***
Pegged regimes	−0.002	−0.13	−0.002	−0.19
Floating regimes	0.015	1.26	0.014	1.20
Real exchange rate	−0.042	−1.24	−0.042	−1.24
World GDP growth	2.129	2.86***	2.129	2.86***
Terms-of-trade growth (lagged)	0.029	1.45	0.029	1.45
Number of observations, R^2	1854	0.05	1854	0.05
Upper- and upper-middle-income countries				
Constant	0.054	3.75***	0.054	3.75***
Pegged regimes	−0.006	−0.42	−0.008	−0.53
Floating regimes	−0.001	−0.08	−0.003	−0.20
Real exchange rate	−0.109	−2.25**	−0.109	−2.25**
World GDP growth	4.501	5.31***	4.501	5.31***
Terms-of-trade growth (lagged)	−0.010	−0.48	−0.010	−0.48
Number of observations, R^2	777	0.11	777	0.11
Lower- and lower-middle-income countries				
Constant	0.039	1.97**	0.039	1.97**
Pegged regimes	0.010	0.52	0.009	0.49
Floating regimes	0.035	1.73*	0.034	1.69*
Real exchange rate	−0.032	−0.76	−0.032	−0.76
World GDP growth	1.048	1.04	1.048	1.04
Terms-of-trade growth (lagged)	0.051	1.76*	0.051	1.76*
Number of observations, R^2	1077	0.05	1077	0.05

Asterisks denote statistical significance at the 10(*), 5(**), and 1(***) percent levels, respectively.
[a] Direct effect of the exchange rate regime on export growth plus indirect effect through real exchange rate, given by $\beta_{Peg} + \beta_{RER}(\Delta RER_{Peg} - \Delta RER_{Cbd})$ and $\beta_{Flt} + \beta_{RER}(\Delta RER_{Flt} - \Delta RER_{Cbd})$ for pegged and floating regimes, respectively.

related to export performance, while lower-income countries with currency boards or other pegged regimes experienced lower export growth performance.

7.5 Conclusions

The stylized facts reported in chapter 5 suggested that currency boards, far from incurring a growth penalty, might actually bring a bonus. This chapter served to explore the robustness of this intriguing finding. The evidence suggests that the link is fragile. Conditioning on other variables that are typically included in cross-country growth regressions, the growth rate does not appear to be robustly related to the exchange rate regime for upper-income countries. For lower-income countries, we do find an economically and statistically significant effect in favor of currency boards. While this finding is robust to possible cross-regime contamination or bounce-back effects stemming from currency boards often being adopted after times of economic distress, it is not robust to the inclusion of country fixed effects or correcting for possible simultaneity bias. On balance, the results do not suggest that currency boards have a sturdy causal link to growth. By the same token, there is no evidence suggesting that countries with currency boards (at any income level) suffered slower growth as a result of the exchange rate regime. Currency boards are, however, associated with slower growth of exports compared to floating exchange rate regimes—but no more so than other pegged exchange rate regimes.

The lack of a robust relationship between currency boards and growth performance should not be surprising since there is little theory linking the nominal exchange rate regime to the average rate of output growth. Theory does predict a link between regimes and the volatility of output (or output growth): since countries with fixed exchange rates have given up the option of using the exchange rate as an adjustment tool, their output should be more volatile if prices and wages are sticky. Consistent with this classic Mundell-Fleming prediction, we find that among upper-income countries—where nominal wages are more likely to be sticky—countries with currency boards indeed experience more volatile output. Conversely, in lower-income countries, where labor markets tend to be informal, nominal wages are less downwardly rigid, and policy itself may be a significant source of shocks, currency boards are not associated with greater volatility.

8 Argentina

The currency board was a means to an end, not an end in itself.

—Paul Krugman, "Argentina's Money Monomania"

A currency board is not "a panacea."

—Sebastian Edwards, "The Great Exchange Rate after Argentina"

The CBA was introduced in Argentina to mend mistakes made in the past, as well as to save the national currency from vanishing altogether.

—Martin Lagos, "The Case for Currency Board Arrangements under the Light of the Argentine Experience"

Circumstantial evidence is a very tricky thing, answered Holmes thoughtfully . . . It may seem to point very straight to one thing, but if you shift your own point of view a little, you may find it pointing in an equally uncompromising manner to something entirely different.

—Sir Arthur Conan Doyle, *The Boscombe Valley Mystery*

8.1 Introduction

The empirical results presented in the previous three chapters provide quite compelling evidence that currency boards lead to lower inflation, both by imposing greater discipline on the monetary authorities and by instilling greater confidence in their policies, that this relationship is robust and not driven entirely by reverse causality, and that it does not come with a penalty in terms of output growth, export performance, or financial sector vulnerability. Proponents often point to such cross-country evidence—albeit usually less systematic or comprehensive—in making the case for currency boards. Critics answer with a single word: Argentina.

Not least because believers in currency boards had been quick to claim credit for Argentina's disinflation following its 1991 (re)adoption of a currency board under the Convertibility Plan,[1] skeptics have been equally quick to point to the 2002 collapse as proof that currency boards "don't work." Some commentators have asserted that Argentina's experience is irrelevant because the regime was not a true currency board (on grounds that, as noted in chapter 4, it allowed part of the reserve coverage to be in the form of U.S. dollar denominated Argentine government paper). The argument has two weaknesses, however. First, in terms of the overall precommitment index, Argentina places not last but fourth among the six modern currency boards examined by Camilleri Gilson (2004, 21), ahead of both Lithuania and Hong Kong. Second, to be relevant, it would have to be shown that the specific deviation in terms of reserve coverage was at the root of the crisis.

Given Argentina's centrality to the renaissance of CBAs, its experience merits special attention. Was the currency board at the root of Argentina's problems in the late 1990s? Should it be found guilty or acquitted of causing the eventual crisis? Is it possible to draw salutary lessons for other countries with similar regimes, including those in central Europe that followed Argentina in instituting currency boards as part of disinflation and macroeconomic stabilization programs?

In this chapter, therefore, we take a detailed look at Argentina's experience with a view to establishing whether the crisis occurred because of or despite the currency board. We begin, in section 8.2, by recounting the background to Argentina's 1991 readoption of a currency board regime. In section 8.3, we review performance under the regime: the initial disinflation success in the early 1990s, weathering the "Tequila" shock in 1994–1995, the downturn in the late 1990s, and finally the 2002 crisis. In section 8.4, we consider alternative explanations for the collapse, focusing on the role of the currency board, in particular whether the regime resulted in an overvaluation of the real exchange rate that led to sluggish export and output growth or whether the strictures of the CBA on monetary policy are to blame. In section 8.5, we draw some conclusions.

8.2 Background

Argentina has not been blessed with monetary stability. Martin Lagos (2000) provides a telling statistic: in 1948, the deutsche mark and the

peso both traded at an exchange rate of four per U.S. dollar; fifty years later, the DM traded at two to the U.S. dollar, the Argentine peso at 10.000.000.000.000 to the dollar. The 1970s and 1980s, in particular, were marred by monetized deficits that repeatedly pushed the economy into bouts of hyperinflation, interspersed with various orthodox and heterodox stabilization programs, all of which ultimately failed in the wake of persistent fiscal excesses. The result was capital flight and pervasive dollarization (Kiguel and Liviatan 1991).

By 1989, the country had descended yet again into monetary mayhem. Monthly inflation rates reached 300 percent while output and investment collapsed. Demonetization accelerated, with broad money (M3) shriveling to just 5 percent of GDP. Following Carlos Menem's electoral victory, another stabilization attempt, based on a conventional exchange rate peg, was launched in 1990. As part of this program, maturing austral denominated debt and the bulk of austral-denominated time deposits in the banking system were converted into longer-term U.S. dollar denominated bonds, sharply increasing the economy's foreign exchange exposure. As Lagos (2000), then deputy governor of the Central Bank of Argentina put it: "On the eve of its [the currency board's] enactment, the nation was bound towards a total 'de facto' dollarization."

The program delivered in the short run. Inflation fell sharply and the exchange rate stabilized. Yet by late 1990, the central bank was back to monetizing deficits in the face of fiscal profligacy and funding shortages in the social security system; and several banks experienced deposit runs. Given Argentina's monetary history, markets did not take long to react: as capital flight and dollarization accelerated again, the inflation-depreciation spiral resumed.

Few options remained for policymakers. With the fresh experience of yet another failed stabilization package, more of the same was unlikely to placate the public or convince the markets. Argentina was ready for a novel approach. Domingo Cavallo—a Harvard-trained economist appointed to the position of Minister of Economy in January 1991—provided it, proposing a return to a currency board arrangement as a cure for fiscal profligacy. Cavallo argued that while a board would not directly address the underlying political economy issues leading to excessive fiscal spending, it would at least limit financing to taxes and to—its (at the time) much underestimated Achilles' heel—debt.

In the face of crisis and the deeply unpopular Plan Bonex, Cavallo's arguments proved convincing.[2] Congress passed the Convertibility

Law in March 1991 and a new central bank charter in 1992. The Convertibility Law established a fixed parity of 10,000 australes per U.S. dollar[3] and gave both the austral/peso and the U.S. dollar legal tender status. The introduction of the currency board was accompanied by a broader reform package intended to signal a decisive break with the past, including fiscal policy measures, the elimination of wage indexation, a comprehensive deregulation of the economy, and, somewhat later, liberalization of capital flows. A further noteworthy innovation was the negotiation of prearranged external credit lines as a partial "privatization" of lender of last resort functions.[4]

Argentina's currency board, while certainly more orthodox than Hong Kong's,[5] differed from a classic currency board in a number of respects, intended to provide some scope for an activist monetary policy:

- A fraction of reserves (initially 10 percent, later raised to 20 percent) could be held in the form of U.S. dollar denominated short-term Argentinean government paper.
- The central bank was allowed to purchase government bonds at market prices. Bond holdings could account for up to one-third of the money base, subject to a cap on the increase of the central bank's holding of treasury bills of 10 percent per year.
- The central bank was further permitted to extend fully collateralized loans to banks for liquidity reasons for up to thirty days and up to the value of the bank's capital.

The modifications allowed the central bank some monetary autonomy and limited lender of last resort capacity, as well as implicit financing of the fiscal deficit. But against the background of Argentina's history of monetary instability, such flexibility also came at the cost of potentially weaker credibility of the regime.

8.3 Performance

The currency board enjoyed a rousing start. Inflation plummeted from several thousand percent in 1989–1990 to 137.5 percent in 1991, 13.7 percent in 1992, and 6.9 percent in 1993—the lowest rate in two decades (figure 8.1, top panel). Output growth—negative through much of the 1980s—rebounded to more than 10 percent in 1991 and 1992 and almost 6 percent in 1993 and 1994 (figure 8.1, bottom panel). Surging

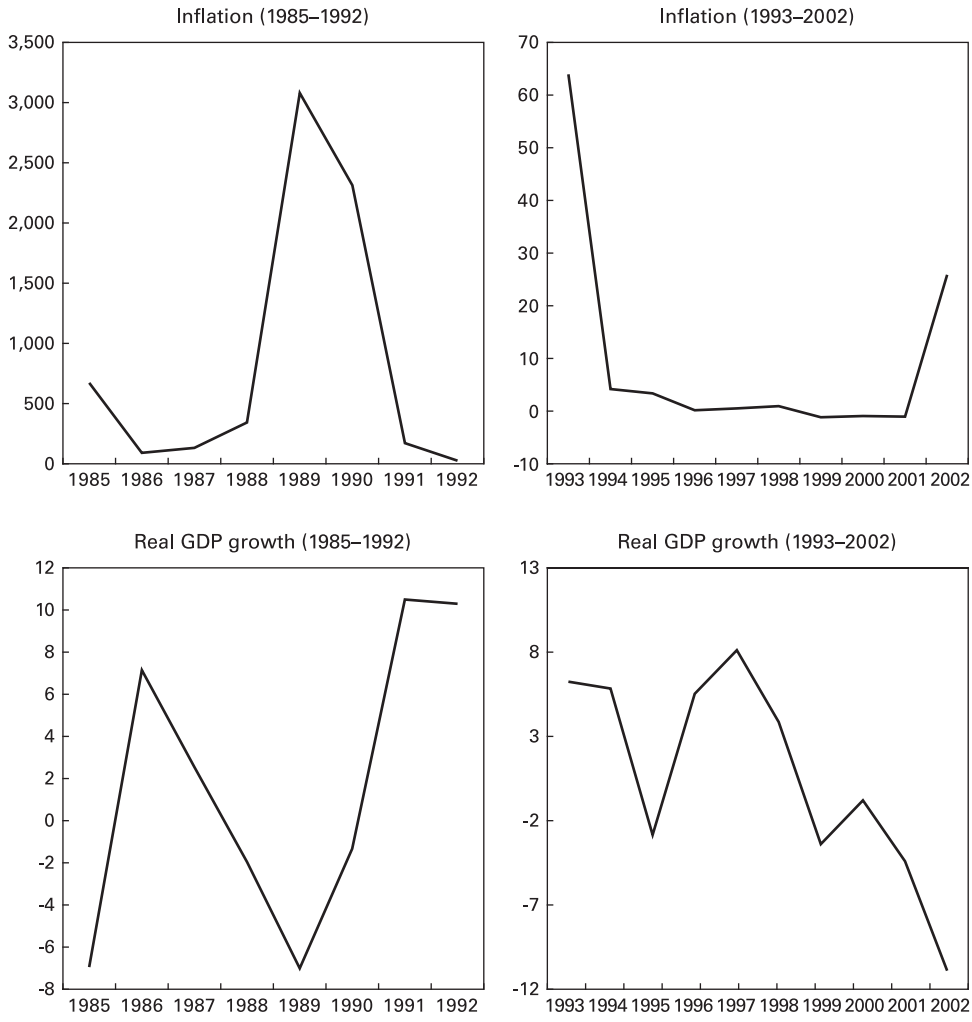


Figure 8.1
Argentina: Inflation and real GDP growth, 1985–2002
Sources: International Monetary Fund; WEO database.

capital inflows allowed a remonetization of the economy: money and credit tripled between 1991 and 1993, lifting the ratio of broad money to GDP to almost 20 percent.

8.3.1 Weathering the First Test

Of course Argentineans had enjoyed the initial successes of exchange rate–based stabilization many times before only to suffer through a subsequent collapse. Would the benefits of the currency board prove more lasting? A first test came in the wake of the Mexican Tequila crisis of December 1994, accompanied by the failure of the Banco Mayo, a major Argentinean wholesale bank. Capital flows reversed sharply with inflows of the preceding years giving way to an outflow of some 5 percent of GDP in the first quarter of 1995. Withdrawals from the banking sector contracted demand deposits by 18 percent in the space of only three months. Perhaps reflecting the history of failed stabilizations, the building tensions soon led domestic interest rates on peso deposits to rise from 10 to 15 percent per year. Interest rates on dollar deposits also rose, but by less. The spread between peso and dollar rates—widening to more than 5 percentage points—suggests both a lack of liquidity and doubts about the health of the banking system and the sustainability of the currency board (figure 8.2).

Confronting the confidence crisis, the authorities responded by reaffirming their commitment to the board, by reducing the reserve requirements of commercial banks to ease liquidity conditions, and by tightening fiscal policy as part of an IMF-supported program. The markets were persuaded, helped also by a better understanding of the roots of the Mexican crisis. Indeed, the very opacity of the Mexican reserve management served to highlight the advantages of currency boards with their frequent reporting requirements and hard foreign exchange-backing rules. As Lagos (2000) notes, referring to the Mexican (and later) Asian, Russian, and Brazilian crises: "There is no doubt that the CBA has been one of the key institutions that allowed our economy to safely sail through each one of these periods of "financial stress."

By mid-1995, capital inflows had resumed, reaching 10 percent of GDP by the end of 1995. GDP, after falling by 2.8 percent in 1995, rebounded with a 5.5 percent growth rate in 1996, though unemployment remained stubbornly high. Having passed its first major test, and having "saved" Argentina from a Mexico-style meltdown, the currency board's popularity soared.

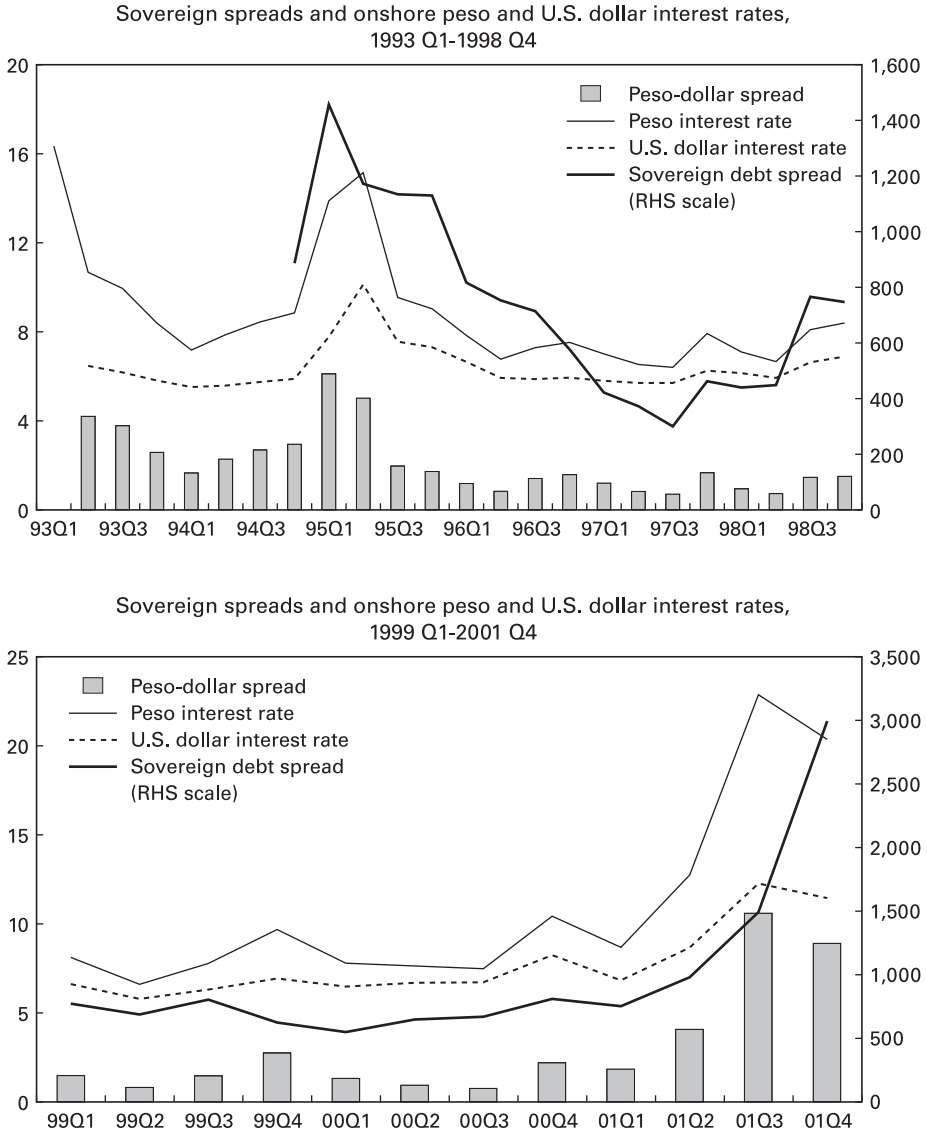


Figure 8.2
Argentina: Interest rates, 1993–2001
Sources: Authorities; International Monetary Fund; WEO database.

8.3.2 The Clouds Darken: The Russian and Brazilian Crises, 1998–1999

Although Argentina weathered the Asian crises relatively well—growth in 1997 was still 8.1 percent—it was not immune to market vicissitudes and contagion. Economic growth in Argentina had already started to slow in the first half of 1998, when the Russian crisis in August 1998 caused another reversal of capital flows to emerging market countries.[6] Argentina's sovereign bond spreads, though low in relation to many other emerging market countries, jumped by 300 basis points. Private portfolio inflows, which had averaged 2.7 percent of GDP in the first three quarters of 1998, fell to virtually zero in the fourth quarter, and to a net outflow of 1 percent in 1999 (in aggregate, private capital flows continued to be positive, mainly on account of FDI-related flows that were already in the pipeline). The shock took an immediate toll on consumer confidence and activity: automobile consumption fell by almost 20 percent between the beginning of 1998 and the end of the year, while real GDP contracted by 3 percent in the fourth quarter of 1998.

The collapse of the Brazilian peg in early 1999, a late repercussion of the Russian crisis, pushed Argentina's real exchange rate further into "overvalued" territory—though by how much remains in dispute, with estimates at the time ranging from 10 to 40 percent (figure 8.3). In the first quarter of 1999, exports dipped by 7 percent in volume terms and by more than 20 percent in value terms. Although the contribution of net exports was positive (on account of even sharper import compression), GDP fell by 3.4 percent in 1999 as eroding confidence took its toll on private consumption and investment.

In the midst of a growing crisis and with an election approaching, the sustainability of the currency board—not seriously questioned before (Perry and Servén 2002)—took center stage in the political debate. Consensus proved elusive, however. Proposed solutions ranged from hardening the system through outright formal dollarization to the adoption of a more flexible system along the Chilean and (following their respective crises) Brazilian and Mexican models.

Proponents argued that dollarization would eliminate the persistent spread between U.S. dollar and peso interest rates, which by now ranged between 1.5 and 3 percentage points, not least reflecting the very debate about the future of the system (figure 8.2, bottom panel).[7] Opponents of dollarization noted that it would not affect—and might even raise—the default risk premium reflecting fiscal overindulgence,

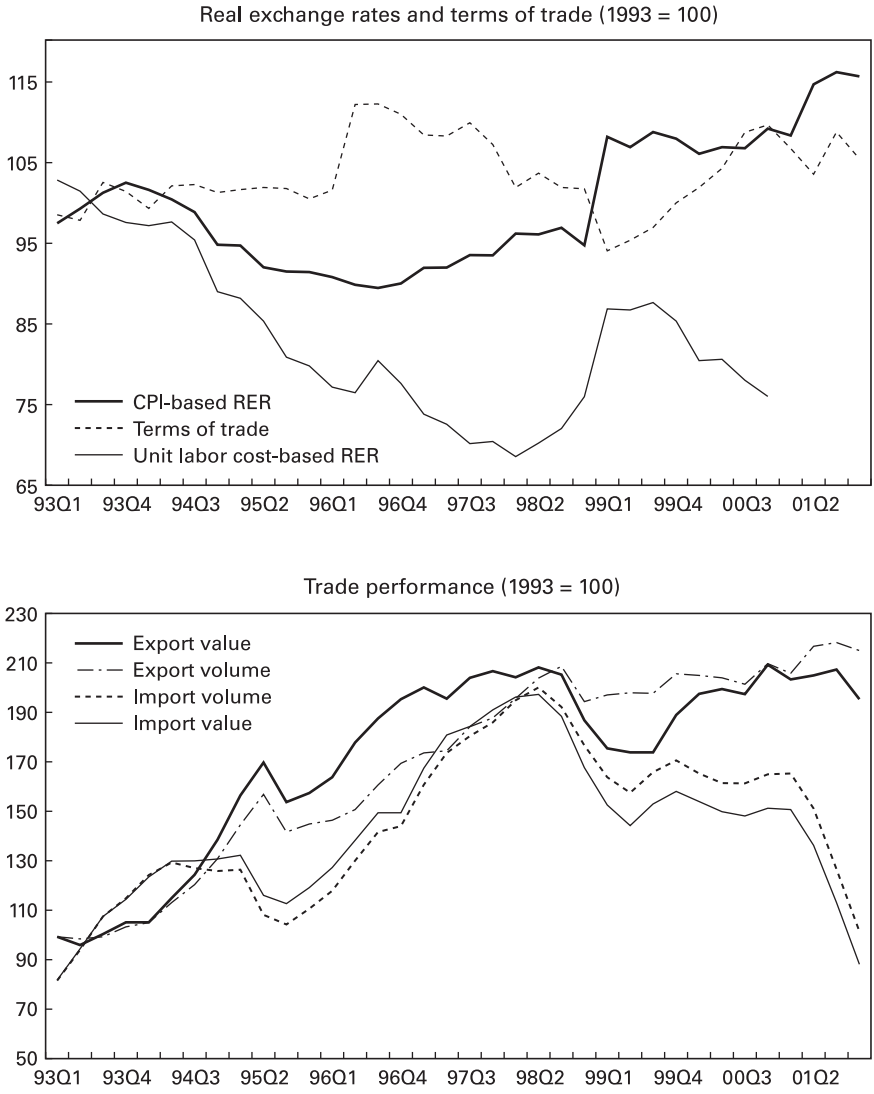


Figure 8.3
Argentina: Real exchange rates, terms of trade, and trade performance, 1993–2001
Sources: International Monetary Fund; WEO database.

and—without an upfront devaluation—would not address the overvaluation problem. Furthermore, it was clear that under any traditional optimal currency area criterion, Argentina and the United States should not share a common currency. Therefore dollarization, which would be an even less reversible tie to the U.S. dollar than the currency board, was a very risky proposition. After several months of intense debate, the dollarization option was shelved in the face of concerns about the costs of losing monetary autonomy combined with a lukewarm reception of the dollarization plan in Washington.

Ending the policy debate, however, failed to return the genie to the bottle: the possibility of an eventual exit from the currency board remained part of market expectations, and with the hardening to full dollarization rejected, the currency risk premium was there to stay. Confidence was further eroded by a perception that commitment to fiscal prudence had weakened. In the run-up to the elections, the overall public sector deficit doubled from 2.1 percent of GDP in 1998 to 4.2 percent of GDP in 1999. Among other discretionary spending, the increase reflected a sizeable rise in public sector employment and wages, raising the public sector wage bill by a full percentage point of GDP. Although public debt (mostly external or dollar denominated), which had risen from 38.8 percent in 1991 to 47.4 percent in 1999, was not out of line with many other middle-income countries in relation to GDP, it was very high in relation to exports (more than 450 percent of exports of goods and nonfactor services). Moreover, the sheer magnitude of Argentina's annual funding needs in relation to flows to emerging market countries, coupled with increasing risk premia, were cause for rising concern.

Throughout 2000 and 2001, the government took a series of steps[8] to revive the economy, partly under the aegis of Domingo Cavallo, who returned to government in March of 2001.[9] To address the overvaluation problem, Cavallo proposed a conditional repegging the peso to a basket consisting of the U.S. dollar and the euro. The law, passed by Congress on June 25, 2001, stipulated that the repegging would take place only once the euro reached parity with the U.S. dollar, at the time implying a significant appreciation of the euro; as it turns out, the system collapsed before the parity was reached. In the meantime, a "convergence factor" for foreign trade was also introduced, which provided for a preferential exchange rate for exporters relative to importers.[10]

These measures provided little relief and came at the cost of muddying a hitherto fairly transparent system, as well as imposing large medium-term fiscal costs. Tinkering with the exchange rate system was perceived as a devaluation in disguise. Further undermining confidence in the viability of the board, it prompted a jump in the currency risk premium from 3.7 percentage points in June 2001 (having averaged 4.5 percent in the first half of the year) to more than 16 percentage points by July. Meanwhile, the voluntary debt swap, which lengthened the maturities of US$29.5 billion (face value) of public debt, reduced debt service obligations during 2001–2005 by US$12 billion but at an extremely high cost to the longer-term solvency of the public sector: the implicit interest rate paid by Argentina on the swapped amount was close to 17 percent per year.

Pressured by a combination of slow world demand for Argentinean exports, low consumer confidence, and investment depressed by uncertainty and high interest rates, GDP fell by another 0.5 percent in 2000 and by 4.5 percent in 2001, eroding revenues and further undermining confidence in the sustainability of the public finances. The debt-to-GDP ratio increased rapidly, from 47.4 percent in 1999 to 64.1 percent in 2001. The funding gap, US$15 billion to roll over maturing debts, and an additional US$20 billion to cover the cash deficit and short-term debt obligations, amounted to almost 40 percent of all emerging market bond issues. With credibility on the wane, external funds were no longer cheap and abundant: by mid-2001 spreads on Argentine debt reached 1,500 basis points, making it all but impossible to generate the primary fiscal surpluses consistent with a stable debt/GDP ratio.

8.3.3 The Endgame

An old adage holds that financial crises always take longer than expected to materialize, but, once in progress, unfold much faster than expected. The final phase in Argentina began as depositors, recalling how previous crises had resulted in deposits being frozen (as indeed subsequently happened in the 2001–2002 crisis), and losing faith in the convertibility promise, began to withdraw funds, preferring to hold cash savings in U.S. dollars and transferring funds offshore. The banking system took the brunt of this loss of confidence in part because the relatively long maturity of government debt limited the pace at which investors could otherwise withdraw from Argentina. In total, during

the course of 2001, domestic deposits and external liabilities fell by some US$24 billion, requiring the banking system to reduce its lending to the private sector by some US$12 billion, run down liquid assets by US$5 billion, and borrow some US$9 billion from the central bank. As Edwards (2002, 9) notes, this experience shows that even banking systems with a large presence of foreign banks are not immune to runs.

Following withdrawals of private sector deposits totaling more than US$3.6 billion (6 percent of the deposit base) on November 28–30, the authorities imposed a wide range of controls on banking and foreign exchange transactions, including a weekly limit of 250 pesos on withdrawals from individual bank accounts (*el corralito*), a prohibition on banks granting loans in pesos, and foreign exchange restrictions on travel and transfers abroad. The ensuing riots and protests—in which more than 20 demonstrators died—forced the resignations of Domingo Cavallo as Economics Minister on December 19, followed a day later by President de la Rua.

Three interim presidents followed in rapid succession—one of whom, Adolfo Rodriguez Saá, formalized the obvious by declaring a default on Argentina's foreign debt—before Eduardo Duhalde, chosen by Congress, was sworn in on January 1, 2002, to complete de la Rua's shortened term. The formal end of the currency board came on January 6, 2002, in the shape of the Law of Public Emergency and Reform. While a devalued exchange rate of 1.40 pesos per U.S. dollar was retained for some transactions, most transactions were to take place at a floating rate, which, though heavily circumscribed by convertibility restrictions and influenced by extensive intervention, began to depreciate rapidly, reaching four pesos per U.S. dollar in July 2002.

The banking system, already hit by the default on government bonds, was further weakened by the asymmetric "pesoization" of bank assets and liabilities, whereby home mortgages below US$100,000 would be serviced at the old exchange rate of 1 peso per dollar, but dollar deposits would be valued at 1.4 pesos per U.S. dollar. Much of the banking system fell into technical bankruptcy, triggering renewed large-scale withdrawals. Although the monthly deposit withdrawal limit was raised to 1,500 pesos (from its previous limit of 1,000 pesos), there was a freeze of term deposits (maturities were extended according to account balances), and it was announced that dollar deposits were to remain frozen until at least 2003.[11]

8.4 The Role of the Currency Board in the Crisis

Not least because proponents of the currency board had been quick to claim credit for early successes, Argentina's experience inevitably raises the question of whether the currency board must also be held responsible for the collapse of the stabilization program—indeed, of the entire economy. Views on this question differ sharply. Some authors see the board as the root cause of Argentina's travails. Others trace the collapse to multiple causes, some homegrown (including lack of fiscal restraint, exchange rate exposure, financial sector fragility, policy errors, and political conflict), some external (capital flow reversal, Brazilian crisis) interacting with the currency board.[12] Yet others argue that the Argentine regime was not a "true" currency board (because its design allowed for some monetary autonomy) and conclude either that this was the real root of the problem or that Argentina's experience cannot be used to infer lessons about the performance and properties of "genuine" currency boards.

In assessing the causes of Argentina's economic collapse in early 2002, one should remember that this was fundamentally a public *debt* crisis. It was not a classic currency crisis where the central bank has been printing money (or the country suffers an external shock) and runs out of reserves with which to defend the fixed parity. In fact, Argentina's central bank still had foreign exchange reserves at the time of the collapse (albeit not enough to cover foreign currency deposits being withdrawn from the banking system), suggesting that harder foreign exchange backing rules for pesos in circulation would have made little difference. Moreover, although the banking crisis was an important element of the story, it is unlikely that there would have been wholesale withdrawals of deposits had there not been a loss of faith in the government's ability to honor its obligations. In contrast to the banks in the Asian crisis countries, the Argentine banking system was generally viewed as sound and well managed (except for their large holdings of government paper).[13]

Therefore, if the currency board is responsible for Argentina's 2002 crisis, it must be mainly by depressing economic activity in the post-Russia crisis period, in turn depressing revenues and adding to the rising debt burden. In fact, revenues (as a proportion of GDP) remained fairly stable, rising by 1 percent of GDP between 1998 and 2000 before declining again by 1 percent of GDP in 2001 (as real GDP fell by 4.4

percent that year). On the other hand, the autonomous component of the public debt dynamics (reflecting the differential between the interest rate and GDP growth) was an important element, contributing 17.3 percent of GDP of the total increase of 21.4 percent of GDP in the public debt ratio between end-1998 and end-2001 (see Daseking et al. 2005, Table 2). This reflected both rising interest rates on government debt—which rose from 7 percent per year in 1998 to 9 percent per year by 2001—and declining growth rates, which fell from 8.8 percent in 1997 to 4 percent in 1998 and −4.4 percent by 2001.

If the currency board indeed contributed to the debt crisis by depressing economic activity, the two most obvious channels would be through a real exchange rate overvaluation that stifled the traded goods sector or a liquidity squeeze brought about by the rules of the board. The evidence for these explanations is considered next.

8.4.1 The First Channel: Did the Real Exchange Rate Become Overvalued?

The real effective exchange rate appreciated markedly under the currency board regime, rising by some 50 percent between 1991 and 2001, but the appreciation process was far from smooth. The real exchange rate jumped sharply in the two years after stabilization. To the extent that the nominal exchange rate overshot during the hyperinflation, this initial appreciation is likely to at least partly reflect a return to equilibrium, a view consistent with the evidence presented by Perry and Servén (2002).[14] By 1993, the adjustment was completed; for the following six years the real exchange rate was stable. The Brazilian devaluation in early 1999 and the appreciation of the U.S. dollar against other major currencies initiated a second period of real appreciation, by some 20 percent by the time of the collapse.

A closer look at the data does not provide much support for the view that the real appreciation was a particularly important explanation for the crisis. In volume terms, exports of goods and services rose by an *average* of 34 percent per year between 1991 and 1998 (27 percent in value terms)—at a time when the cumulative increase in the real exchange rate was 30 percent. Largely, of course, the initial surge reflected a recovery from the chaos of the hyperinflation. But even from the end of 1993 to the beginning of 1999, exports grew at an average annual rate of 13 percent (and imports grew at an average rate of 8 percent per year; figure 8.3). While export growth did slow down markedly in 1998, this was almost entirely due to a terms-of-trade

shock (which deteriorated by 6 percent), with exports still growing at 15 percent per year in volume terms in the first half of 1998 and at 9 percent per year in the second half of 1998 (relative to the same periods in the previous year), while the real exchange rate appreciated by some 4 percent over the year. Following the devaluation and contraction in economic activity in Brazil in early 1999, Argentina's exports fell by 15 percent in the first half of 1999, but again this primarily reflected a further terms-of-trade deterioration with the decline in volume terms of only 1.5 percent (meanwhile, Argentina's imports fell by 19 percent). By 2000, assisted by a recovery in the terms of trade, exports were growing at 12 percent per year, though only 4 percent per year in volume terms.

Taken as a whole—and especially in relation to developments in Argentina's export markets and the terms-of-trade shocks—the evidence does not point to a real exchange rate overvaluation as a primary constraint on exports. Export performance over the entire currency board period was healthy, generally outstripping the growth in export markets (figure 8.4), and given Argentina's concentration of exports to Brazil (partly a result of the Mercosur trading arrangement), it weathered the Brazilian crisis relatively well.

But even if exports suffered because the currency board did not allow a corresponding devaluation following Brazil's abandonment of its peg, the combination of a low price elasticity and a small share of exports (10 percent of GDP) means that this cannot be a major part of the explanation for why Argentina went into recession.[15] Thomas (2002) estimates import and export functions, separating commodities (for which the world price is given) from manufactures. His results indicate that a 20 percent real depreciation—more than offsetting the effect of the Brazilian devaluation of 1999 and returning the real exchange rate to its pre-1993 level—would have raised the peso value of export revenues and import expenditures by 8 percent[16] and 5 percent respectively, increasing real GDP growth by 0.25 percent, a negligible magnitude compared to the more than 8 percent output decline actually observed in the 1999–2001 period.[17]

8.4.2 The Second Channel: Monetary Policy and Interest Rates

An alternative hypothesis holds that, despite the scope for at least some discretionary monetary policy under the design of the Argentine regime, the rules of the CBA circumscribed the central bank's ability to extend domestic credit, in turn limiting banking system credit to the

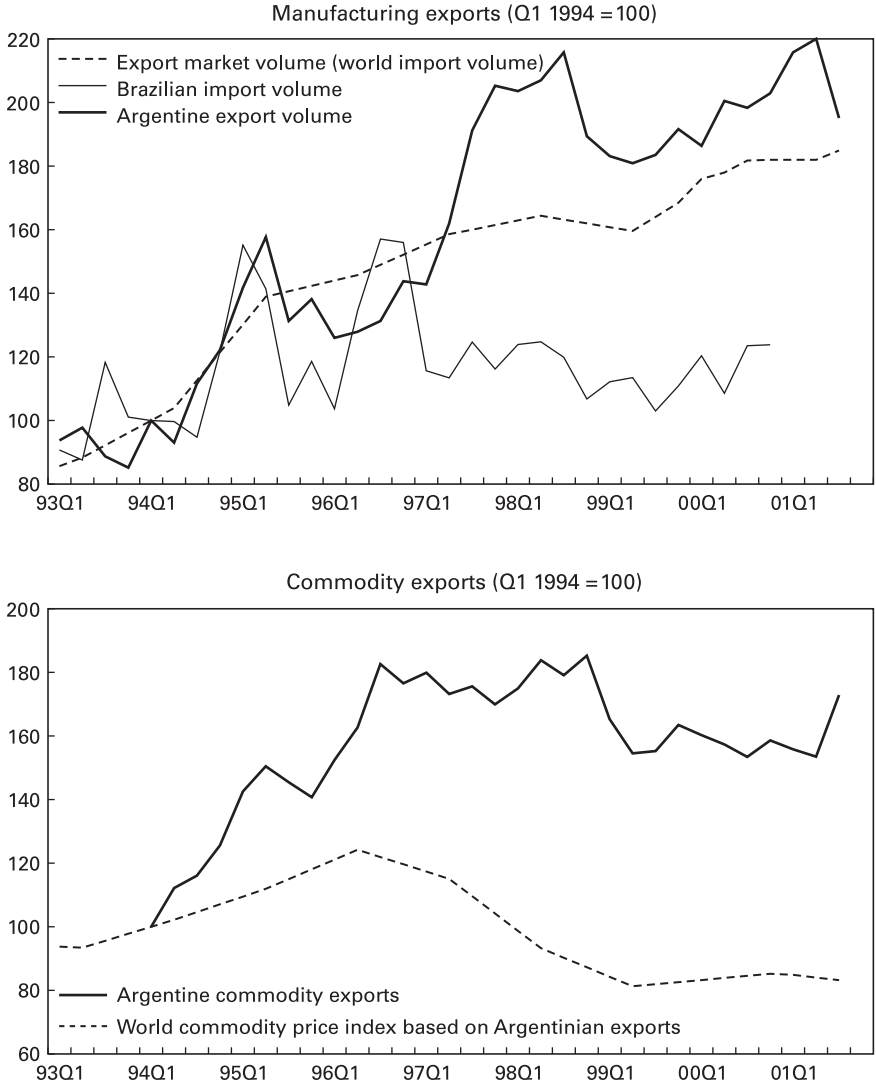


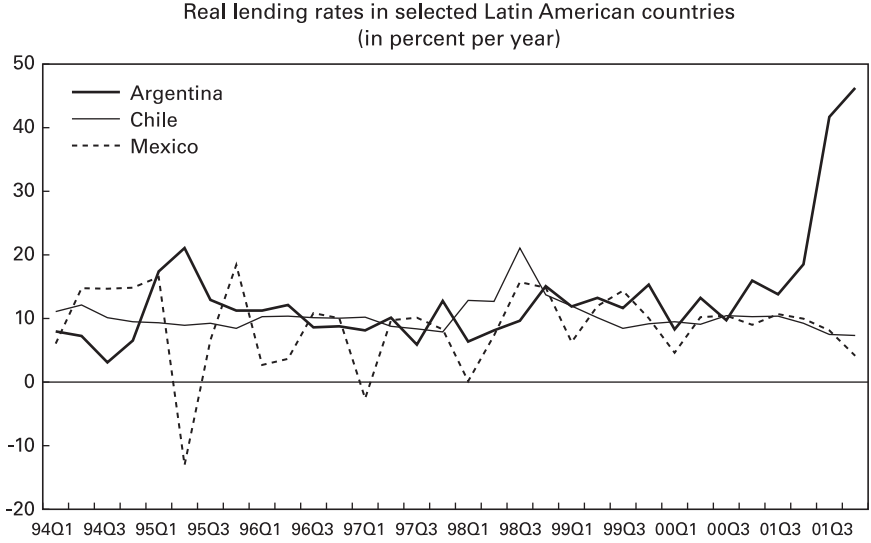
Figure 8.4
Argentina: Export performance, 1993–2001
Sources: Authorities; International Monetary Fund; WEO database.

economy and dampening activity when the economy went into recession in late 1998 and early 1999.

Tight monetary conditions manifest themselves in high real interest rates or in quantity rationing.[18] Between 1994 and end-2000, peso real lending rates in Argentina averaged 11 percent per year (rising to 20 percent in the first half of 1995 during the Tequila crisis), while real overnight interbank rates averaged some 7 percent per year. Real lending rates rose sharply with the Russian crisis, increasing from around 7 percent per year in the first half of 1998 to around 12–13 percent per year in the second half of 1998 and during 1999.

Would these rates have been lower had Argentina operated under a float in a different exchange rate arrangement? While such counterfactuals are all but impossible to establish ex post, a number of arguments suggest otherwise. First, Argentina—together with many other emerging market countries—suffered a withdrawal of external savings as private capital flows slowed or even reversed in the aftermath of the Russian (and later, Brazilian) crisis—so an increase in real interest rates was to be expected. Second, during the same period, real lending interest rates averaged 67 percent per year in Brazil, 9 percent in Mexico, and 12 percent in Chile, while the increase in real interest rates in these countries (all of which had a floating regime) were generally as large as, or larger than, the increase experienced in Argentina (figure 8.5). It seems unlikely, therefore, that interest rates in Argentina would have been much lower under a floating exchange rate regime.[19] Indeed, the experience of these other countries suggests that, faced with capital outflows, the scope for activist monetary policy in developing and emerging market countries may be limited regardless of the exchange rate regime.

The possibility of quantity rationing of loanable funds can be assessed through the banking system's lending capacity, defined as total assets minus cash-in-vault, required liquidity reserves held at the central bank, and equity. By increasing its liabilities—either by accepting deposits, borrowing abroad, or (when possible) borrowing from the central bank—the banking system increases its capacity to provide loans to either the private or the public sector. The evolution of banking system lending capacity, thus defined, is shown in figure 8.5 (bottom panel). Although central bank loans to the banking system became negligible under the currency board regime, the steady growth of deposits and capital inflows (except in 1995) allowed an expansion of banks' lending capacity until 1998. In 1998, there was a temporary



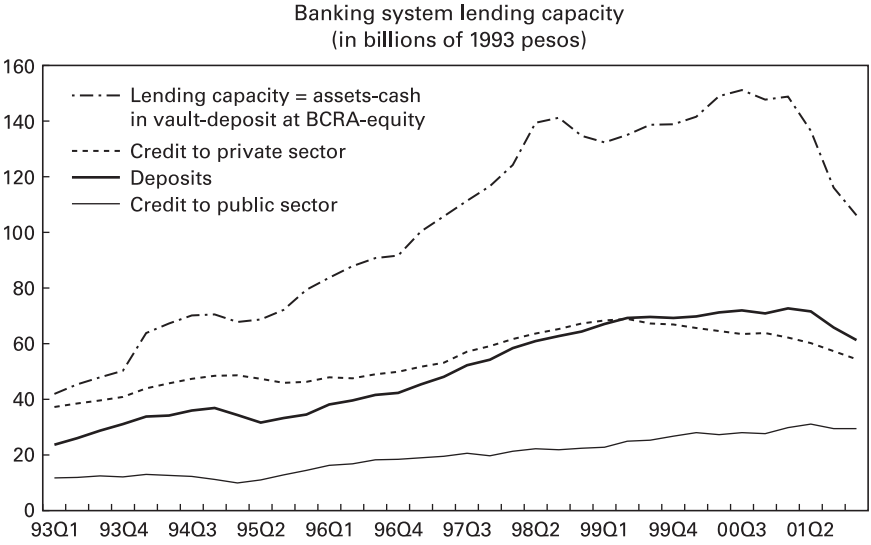


Figure 8.5
Argentina: Real interest rates and banking system lending capacity
Sources: Central Bank of Argentina; authors' calculations.

decline in lending capacity, but this was reversed by mid-1999, although growth rates slowed markedly. It was only in mid-2001, with withdrawals of deposits, that the lending capacity of banks was reduced appreciably (and broad money contracted by almost 25 percent),[20] again too late to explain a crisis commencing in 1998.

Even if monetary conditions were not especially tight, an important criticism of the currency board (or any fixed exchange rate regime) is that external adjustment needs to take place through price deflation, which is generally painful and recessionary. One hypothesis therefore is that in the face of the slowdown (and partial reversal) of inflows to emerging markets following the Russian (and Brazilian) crisis, Argentina needed to reduce its current account deficit. As noted, price elasticities and the share of traded goods in Argentina were low, requiring a large real exchange rate depreciation if the adjustment is to be achieved only through the relative price channel (rather than through structural reforms and fiscal adjustment) and corresponding price deflation. In fact, the GDP deflator fell 0.5 percent in 1997 (albeit a boom year), and a further 1.5–2 percent in 1998 and 1999. Could the latter explain the growth slowdown? Daseking et al. (2005) report the results of a cross-country model in which inflation below a certain threshold reduces growth; applying these estimates to Argentina's deflation suggests that real GDP growth may have been 0.5–1.5 percentage points per year lower than it could have been in 1998/1999 without such deflation. This is not negligible but falls far short of explaining the almost 12 percentage point slowdown in economic growth rates between 1997 and 1999.

A rather different channel through which the currency board may have worsened the crisis is by encouraging liability dollarization—borrowing both externally and domestically in U.S. dollars. While such dollarization may not have caused the crisis, it certainly limited policy options in the run-up to the crisis and exacerbated its eventual costs. Yet it is not clear that the currency board resulted in greater U.S. dollar denominated external borrowing: "original sin"—especially in a country with such a history of inflation and depreciation—often forces developing and emerging market countries to borrow in foreign currency regardless of the exchange rate regime because their own currency does not enjoy sufficient credibility. As regards domestic financial transactions, it is difficult for the exchange rate guarantee to explain both greater borrowing *and* greater lending in foreign currency.

Empirically, there does not seem to be any association between currency boards (or indeed fixed exchange rate regimes more generally) and dollarization of the banking system (see chapter 5).

8.4.3 Reform Slowdown and Consumer Confidence

It thus seems unlikely that the currency board per se played a major role in the growth slowdown. Yet what else can explain it? Partly it was the transition from the "easy" to the "hard" part of sustained reforms. The initial growth explosion of the early stabilization period was a rebound of output to potential after the disruptions of the hyperinflation period. By the mid-1990s, these effects had petered out; further growth required an organic expansion of capacity, and thus a removal of the interventionist shackles that had long constrained Argentina's postwar economy. Substantial progress on this front had been made during Menem's first term, including privatization, partial deregulation, pension reform, financial liberalization, and efforts at regional trade liberalization. Yet the zeal for further liberalization waned during Menem's second term, in part because of political compromises as he sought a third term in office.

Labor market reforms remained the most pressing remaining challenge. Historically, Argentina's labor regulations had been highly protective of individual workers' interests, with effective tenure and extensive fringe benefits. A series of reforms in the early 1990s aimed to enhance labor market flexibility; but as the decade progressed, these (and other planned) reforms were either diluted or, in some cases, entirely reversed.[21] Output growth consequently failed to translate into robust job growth. During the boom years of 1991–1998, the unemployment rate averaged 14 percent even as real GDP rose by 50 percent.

On the demand side, the Russian crisis and slowdown of capital flows to emerging market countries took a toll on consumer confidence, given the close association between sovereign debt spreads and consumer confidence as reflected, for example, in sales of durables such as automobiles.[22] Aggravating the effects of the external shock may have been political uncertainty, particularly associated with Menem's bid for an unprecedented third term in office. Recent research has underscored the possible impact of such uncertainty on economic activity, and estimates based on cross-country growth regressions reported in Daseking et al. (2005) suggest that the election uncertainty may have reduced growth by some 2 percentage points in

1998–1999—though such estimates should not be taken too literally. Preelection spending may also have undermined confidence in the sustainability of the public finances, which was soon to be tested.

8.4.4 Fiscal Policy

As Sherlock Holmes advises in *The Sign of Four*, "Eliminate all other factors, and the one which remains must be the truth."[23] The previous discussion suggests that neither the exchange rate overvaluation nor tight monetary conditions under the currency board can—at least in isolation—explain Argentina's 2002 crisis.[24] And of course there is nothing very improbable about fiscal policy being the primary culprit of a public debt crisis.

The overall balance of the consolidated nonfinancial public sector was in deficit virtually every year between 1992 and 2001. This, together with the discovery of "fiscal skeletons" (hidden or unrecognized liabilities of the public sector) and other below-the-line items meant that public sector debt, nearly all of which was foreign currency denominated, doubled from 31 percent of GDP in 1992 to more than 62 percent of GDP by end-2001 (figure 8.6). Even in 1999–2001, as it became apparent that Argentina was facing a major fiscal problem, targets for both the primary and overall fiscal balances were repeatedly missed.[25]

Perhaps even more important, debt was growing during the boom years (1992–1997)—not only implying fiscal profligacy but also leaving little room to maneuver when the downturn came in 1998. As discussed, the experience of other Latin American emerging market countries suggests that there would have been little scope for using monetary policy to offset the external shock regardless of the exchange rate regime. The onus for maintaining macroeconomic stabilization was thus squarely on fiscal policy. But by then, Argentina's debt was too high to allow a substantial fiscal expansion without further undermining confidence and probably deepening the recession.

What was the role of the currency board in all this? Under any fixed exchange rate regime, money financing of the deficit (beyond the growth in money demand) leads to a loss of reserves and a speculative attack. Therefore, either the regime collapses or fiscal policy must be sufficiently disciplined. When the government can borrow, the immediate link between the viability of the fixed exchange rate regime and the need for fiscal discipline is loosened but not eliminated. Specifically, as discussed in chapter 3 (box 3.1), when the government can

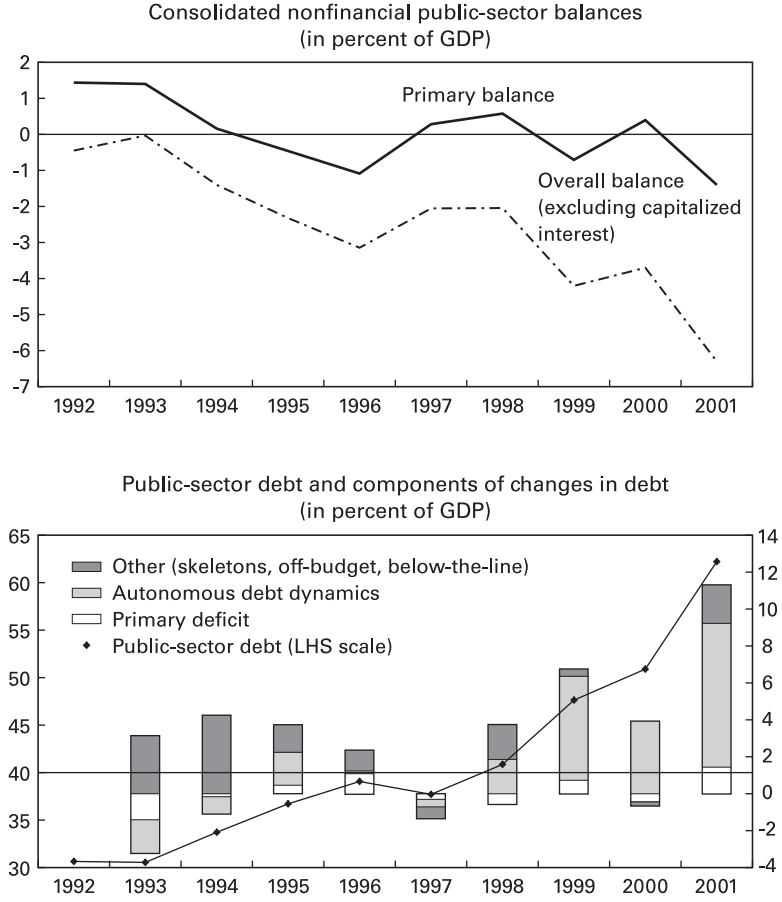


Figure 8.6
Argentina: Fiscal balances and public sector debt, 1985–2002
Sources: International Monetary Fund; Daseking et al. (2005).

issue debt, consistency with the fixed exchange rate regime requires that the present value of future fiscal surpluses be sufficient to meet the public sector's nominal liabilities at the price level (and exchange rate) implied by the fixed parity—or the fixed exchange rate must eventually collapse.

In 1991, Cavallo diagnosed unsustainable public debt dynamics as the core driving force behind inflation. He was right that the currency board would (largely) shut down the monetary financing mechanism, but he was wrong in assuming that this would by itself address the underlying political economy reasons for Argentina's persistent defi-

cits. Though the currency board enjoyed widespread popularity, this proved insufficient to induce the fiscal discipline necessary for its long-term viability.

To be sure, Argentina suffered from some major external shocks, including the repercussions of the Russian and Brazilian crises, as well as important structural weaknesses, but a more prudent fiscal stance during the boom years together with a more determined fiscal adjustment starting in 1999 might have averted the crisis.[26] Yet lenders are also to blame for continuing to provide funding even as the sustainability of public finances came into question, perhaps because they were seduced by the credibility and domestic popularity of the currency board. Ironically, therefore, the very credibility that the currency board engendered not only eased open the door to the debt markets as a source of nonmonetary financing but allowed the government to borrow to the point of the regime's demise.[27]

8.5 Conclusion

There can be little argument that Argentina's currency board was instrumental in its successful disinflation: for the first time in postwar history, Argentina experienced nine consecutive years of single-digit inflation. The stabilization allowed the economy to rebound from the havoc wrecked by hyperinflation. By the mid-1990s, the currency board was widely viewed as a success, especially when it allowed Argentina to weather the Mexican crisis largely unscathed. Indeed, the regime was held in such high esteem it was commonly cited as a role model for other countries wishing to stabilize against a history of high- or hyperinflation, including the euro-based currency boards we review in the following chapters.

Some authors, while acknowledging the crucial role played by the currency board in achieving macroeconomic stabilization, argue that Argentina should have moved to a more flexible regime much earlier. Yet it is not clear that there were many opportunities for doing so without the risk of reigniting inflationary expectations or precipitating a crisis. Macroeconomic stabilization had only recently been achieved when the Mexican crisis erupted in late 1994, testing the new regime. An exit from the board might have been relatively straightforward in 1996, but it is unclear that there would have been much political support for abandoning the regime that had performed so well. By 1997, the Asian crisis was shining a spotlight on all emerging market

borrowers, as did the Russian crisis in 1998 and the Brazilian crisis in 1999. With financial markets already jittery, an exit at any of these junctures might have risked triggering the very crisis it was intended to avoid.

More important for our purposes, it is not at all obvious that exiting the regime was necessary. As argued earlier, it is very difficult to pin the crisis directly on the currency board. Though the real exchange rate appreciated, export performance was generally healthy and in any case cannot account for the growth slowdown. Also, while real interest rates rose following the Russian crisis, they did not rise by more than in other countries in the region with more flexible exchange rates, and the currency board strictures on monetary policy do not appear to have been binding. Thus adverse external developments, unwise fiscal policies, and the failure to follow through on stabilization with structural reforms have to shoulder a fair share of the blame.

Yet the currency board does not get a full acquittal. Part of the purpose of the regime was to help instill macroeconomic discipline. Instead, its very success may have reduced the political pressure for reform, while the stability of the exchange rate prompted domestic borrowers and external lenders to build up a level of dollar indebtedness that eventually made a smooth exit from the board prohibitively costly. Moreover, neither in 1995 nor in 2001 did the currency board regime prevent a loss of confidence in the banking system and a corresponding withdrawal of deposits.

If a lesson is to be drawn from the Argentinean experience, therefore, it is that the monetary discipline engendered by the board can only go so far unless it is accompanied by restrictions on fiscal policies and structural reforms facilitating the adjustment to the inevitable vicissitudes of economic life.

Appendix

Table 8A.1 provides selected macroeconomic indicators covering the period of Argentina's currency board.

Table 8A.1
Argentina: Selected macroeconomic indicators, 1980–2002

	1980	1985	1990	1991[a]	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Real GDP growth (in percent per year)	0.7	−7.0	−1.3	10.5	10.3	6.3	5.8	−2.8	5.5	8.1	3.9	−3.4	−0.8	−4.4	−10.9
Real GDP per capita growth (in percent per year)	−0.8	−8.5	−3.4	9.0	8.8	6.6	4.7	−3.9	4.4	7.0	2.8	−4.4	−1.8	−5.4	−11.8
Unemployment rate	3.0	6.2	7.6	6.5	7.1	11.7	14.4	18.9	19.1	15.9	14.7	16.2	17.4	20.7	20.7
Inflation (average of period)	100.8	672.2	2314.0	171.7	24.9	10.4	4.2	3.4	0.2	0.5	0.9	−1.2	−0.9	−1.1	25.9
Inflation (end-of-period)	87.6	385.4	1343.9	84.0	17.5	7.4	3.9	1.6	0.1	0.3	0.7	−1.8	−0.7	−1.5	41.0
Broad money (growth, in percent per year)	113.8	435.0	1059.4	167.9	63.0	55.9	14.9	−4.3	20.0	26.9	9.7	2.8	2.3	−21.0	15.3
Broad money (in percent of GDP)	24.2	16.8	10.4	10.6	13.8	20.7	21.8	20.8	23.7	27.9	30.0	32.5	33.2	27.7	27.5
Reserve money (growth, in percent per year)	78.9	386.9	584.8	116.3	40.7	36.1	8.5	−15.4	2.1	13.6	2.6	0.8	−8.8	17.9	69.8
Reserve money (in percent of GDP)	6.1	9.7	5.2	4.3	4.9	6.3	6.3	5.3	5.2	5.5	5.5	5.8	5.3	6.6	9.7
Net foreign assets (in percent of reserve money)[b]	65.7	−9.5	−48.2	−14.0	76.2	78.5	72.7	71.6	95.7	106.0	126.9	138.2	145.1	7.5	−43.3
Credit to private sector (in percent of GDP)	—	—	9.6	10.2	12.8	16.5	18.5	19.3	18.9	19.9	22.4	24.3	23.4	22.1	—
Credit to private sector (growth, in percent per year)	—	—	—	179.4	56.9	34.8	22.1	4.7	3.2	13.3	14.6	3.3	−3.8	−10.4	—
Nonperforming loans (in percent of banking sector assets)	—	—	—	—	—	—	—	0.8	3.5	5.0	5.6	6.2	8.2	11.1	—

Table 8A.1
(continued)

	1980	1985	1990	1991[a]	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Foreign currency deposits (in percent of deposits)	—	—	35.7	49.8	51.2	51.0	52.9	56.7	56.8	55.5	57.4	61.0	63.5	68.0	—
Foreign currency loans (in percent of deposits)	—	—	39.0	41.1	43.6	47.4	52.1	56.4	59.0	60.2	61.1	61.9	61.6	64.4	—
Money market rate (percent per annum)	86.9	1161.2	9695421.9	71.3	15.1	6.3	7.7	9.5	6.2	6.6	6.8	7.0	8.1	24.9	41.4
Deposit rate (percent per annum)	79.6	630.0	1517.9	61.7	16.8	11.3	8.1	11.9	7.4	7.0	7.6	8.0	8.3	16.2	39.2
General government balance (in percent of GDP)	−3.4	−3.9	−1.7	−1.2	−0.4	0.0	−1.4	−2.3	−3.2	−2.1	−2.1	−4.2	−3.6	−6.1	−16.7
Central government balance (in percent of GDP)	−3.4	−3.9	−1.7	−1.2	−0.2	0.9	−0.5	−1.5	−2.2	−1.6	−1.3	−2.5	−2.4	−3.7	−15.9
General government, net debt (in percent of GDP)	—	—	—	—	—	31.8	34.4	38.3	39.8	38.1	41.3	47.4	51.0	63.1	164.4
Central government, net debt (in percent of GDP)	—	—	—	—	27.5	29.4	31.3	33.8	35.6	34.5	37.5	43.0	45.0	53.8	147.6
Exports of goods and services (in percent of GDP)	5.4	11.4	10.6	7.7	6.6	7.0	7.5	9.7	10.5	10.6	10.5	9.9	11.0	11.6	29.6
Exports of goods and services (real growth, in percent per year)	—	15.6	16.8	−5.1	2.1	1.7	15.3	22.5	7.6	12.2	10.6	−1.3	2.7	2.7	3.1
Imports of goods and services (in percent of GDP)	5.9	6.5	5.0	6.3	8.2	10.4	10.6	10.1	11.1	12.8	13.0	11.6	11.6	10.3	13.7

Imports of goods and services (real growth, in percent per year)	—	−13.0	−0.7	75.6	66.5	13.3	21.1	−9.8	17.5	26.9	8.4	−11.3	−0.2	−13.9	−50.1
Current account balance (in percent of GDP)	−1.2	−1.1	3.3	−0.2	−2.8	−3.4	−4.3	−2.0	−2.5	−4.1	−4.8	−4.2	−3.2	−1.2	8.9
Direct investment, net (in percent of GDP)	0.4	1.0	1.3	1.3	1.8	0.5	1.0	1.2	1.8	1.6	1.5	2.5	2.6	0.7	2.8
Reserves at year-end (in percent of GDP)	3.3	3.9	3.4	3.3	4.5	5.9	5.7	5.6	6.7	7.6	8.3	9.3	8.8	5.4	10.7
External debt, total (in percent of GDP)	13.0	54.5	41.4	32.9	27.4	30.5	33.3	39.3	42.0	44.4	49.4	53.8	54.5	61.9	160.4

Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.

[a] The currency board began operation on March 1991.

[b] Defined as gross foreign assets minus liabilities, may differ from definition of reserves used for currency board coverage purposes.

III

Case Studies in Modern Currency Boards: The European Experience

9 Euro-Based Currency Boards: Introduction

With the demise of the Argentinean currency board in early 2002, four modern currency boards introduced in the 1990s explicitly as part of macroeconomic stabilization efforts remain: Estonia, Lithuania, Bulgaria, and Bosnia and Herzegovina. In this part of the book, we take a closer look at these four cases, focusing on their motivation, performance, and prospects (table 9.1).

9.1 Four Boards—Four Motivations

Estonia, the first transition economy to adopt a currency board, did so as a newly independent country with no monetary track record, in order to import credibility through a hard peg to the deutsche mark (and later the euro). Throughout the 1990s, Estonian governments left little doubt that the board was intended as a long-term regime. As confidence in an eventual EU accession grew, the exit question was quickly settled, with a speedy entry into the Eurozone as the undisputed objective. Against a background of apparent success, domestic political debate has been muted; indeed, the Estonian currency board faced more criticism from abroad than at home. At the time of this writing, the Estonian currency board regime, after successfully weathering a number of financial and real crises, is in its fifteenth year and is expected to enter the Eurozone in the not too distant future, conditional on meeting the inflation criterion.

In contrast to the consistent, popular support for a hard peg in Estonia, Lithuania's flirtation with a currency board has been more capricious. For a period in the late 1990s, an exit from the board was the stated policy goal. The ensuing volatility, coupled with a clearer perspective on EU membership eventually led the authorities to end the discussion in favor of an eventual exit into the Eurozone. Following a

Table 9.1
Core features of euro currency boards

	Bosnia and Herzegovina	Bulgaria	Estonia	Lithuania
Created	1997	1997	1992	1994
Background	War, independence, transition plan to market	Hyperinflation, transition plan to market	Independence, transition plan to market	Independence, transition plan to market
Prior regime	De facto currency board, extensive use of deutsche mark	Floating	Ruble area	Floating following exit from ruble area
Motivation	Postwar reconstruction, building national identity	Stabilization following hyperinflation	Establishing confidence	Stabilization
Legal basis	Dayton Agreement, Law of the Central Bank of Bosnia and Herzegovina (CBBH), Constitution	Law on the Bulgarian National Bank (BNB), Art. 28	Law on the Security of the Estonian Kroon	Law on the Credibility of the Litas
Backing	100% of central bank aggregate monetary liabilities by net foreign assets	100% of central bank aggregate monetary liabilities by gross foreign assets	100% of kroons in circulation by foreign assets	100% of litas in circulation by gross foreign assets
Lender of last resort	Prohibited (subject to discussion)	Yes, in limited circumstances of systemic risk	No formal role	No formal role
Bank reserve requirements	10–15% on all deposits, remunerated	8% on all deposits, not remunerated	10% + 3%, remunerated	8% on deposits of less than 1 year, not remunerated

Sources: Ho 2002, Tables 3.1–3.5; Kamhi and Dehejia 2005; and national sources.

strict application of the inflation criteria, Lithuania's application to join the Eurozone in January 2007 was rejected; however, Lithuania is expected to enter in the not too distant future.

Bulgaria's decision to adopt a currency board has greater similarities to Argentina's adoption of its Convertibility Plan and CBA. In both cases, midsize, relatively closed economies successfully adopted soft currency boards as stabilization tools in the midst of hyperinflation. For a variety of reasons explored in chapter 8, Argentina was ultimately forced to return to a more flexible regime. Bulgaria might well have eventually chosen to move to a more flexible regime as well, were it not for the likely availability of a well-defined exit option into the Eurozone some years after its EU accession in January 2007.

Bosnia and Herzegovina, the last European country to adopt a currency board, presents yet a different case since the fundamental problem was not so much mistrust in the anti-inflation credentials of the monetary authorities but rather the political challenge of formulating and implementing monetary policy in a country nearly torn asunder by years of ethnic conflict. The challenge was solved by disavowing all traces of discretion and outsourcing decision making to a politically neutral external party. The result, introduced as part of the Dayton Agreement, was the toughest of the modern currency boards, headed by a foreigner, with restrictions on lending and net reserve coverage requirements going beyond the IMF's recommendations. The board has worked well so far, and, much as was the case for the DM in postwar Germany, the konvertible marka has attained a symbolic status exceeding its pure monetary role, leading to the currency board being retained beyond the period stipulated in the Dayton Agreement.

9.2 Four Boards—One Exit Strategy

While the economics and politics leading to the adoption of the four European currency boards differ, the four countries share an advantage unavailable to their brethren elsewhere: a well-defined and credible option to exit to a comparably hard regime, the Eurozone, with the support of the current members. The exit option permits the Euro-based boards to sidestep nagging questions about the permanence of the regime and thus the optimal time of exit that so bedeviled Argentina. Not surprisingly, all four euro board countries have publicly committed to a speedy entry into the Eurozone. Estonia and Lithuania are farthest along this route and likely to enter in the near future;

Bulgaria's earliest date for satisfying the criteria would be 2009. Bosnia and Herzegovina likewise has publicly stated the intention to retain its currency board until Eurozone membership, though the timeframe for EU membership remains uncertain.

In the following four chapters we take a closer look at the four individual cases, wrapping up this part of the book with an assessment of their common experiences and outlook in chapter 14.

10 Estonia

Even if we only have eight kroons in circulation, we will have a D-Mark in our vaults to back them.

—Siim Kallas, President of the Estonian Central Bank, 1992

10.1 Introduction

In early 1992, newly independent Estonia found itself operating on the rapidly depreciating Russian ruble. While there was no question that a national currency would be highly popular, policymakers hesitated, concerned that the lack of a track record would condemn the new currency to start with a credibility deficit. A currency board seemed to provide the solution. As the Bank of Estonia put it, "By giving up some monetary autonomy [under a currency board], we received monetary stability in return" (1999, 4).

The idea initially received a mixed external response (Knöbl, Sutt, and Zavoico 2002).[1] While some advisors agreed with the central bank that institutionalizing the hard peg would buttress confidence in the new currency, the IMF was more skeptical, concerned about the implied fiscal constraints in an uncertain political and macroeconomic environment and unconvinced that Estonia's economy was sufficiently flexible to allow adjustments under a board. As the debate unfolded, a consensus emerged that the implied constraints on fiscal discipline and the need for economic flexibility were a worthwhile price to pay for the hoped-for payoff in terms of credibility and stability (De Haan, Berger, and van Fraassen 2001).

With the fundamental decision taken, Estonia turned to the implementation challenges, notably obtaining the foreign exchange reserves sufficient to back the currency. The solution came from an unexpected

quarter. Once Eesti Pank was recognized as the legal successor of the interwar Central Bank of Estonia, the Bank of England returned foreign exchange reserves held on deposit since the absorption of Estonia into the Soviet Union. Coupled with additional funds held by the Bank for International Settlements (BIS) and the Swedish National Bank, the returned reserves sufficed to provide not only full coverage of notes and coins, but a substantial excess reserve cushion (Pautola and Backé 1998; Knöbl, Sutt, and Zavoico 2002). Estonia became the first former Soviet Union (FSU) member to depart the ruble zone, introducing the new currency, the kroon, and transitioning to the currency board on June 20, 1992. The acceptance of the kroon was supported by the broader political climate; the new money became a symbol of the newly reestablished independence.

10.2 Structure

Among modern currency boards, the arrangements adopted in Estonia and Bosnia and Herzegovina come closest to the traditional model (Camilleri Gilson 2004). On the legal level, the structure is set out in the Law on the Security of the Estonian Kroon. The board is enshrined in the constitution, requiring a supermajority for alterations. The board, managed by the politically independent Bank of Estonia, is not formally split into a banking and an issue department but is prohibited from lending directly to the public sector. While the Bank of Estonia has the right to revalue the kroon upward, devaluations require an act of parliament with a qualified majority (De Haan, Berger, and van Fraassen 2001). The kroon was anchored to the deutsche mark at the rate of 8 to 1.[2] Following two years of successful operations, the board was further hardened in August 1994 through the full liberalization of international capital transactions (Nenovsky, Hristov, and Mihaylov 2002).

The Estonian currency board arrangement combines the discipline of a fairly hard peg with a limited scope for monetary policy provided by excess reserves as well as through the ability of the Bank of Estonia to set and change reserve requirements, through a deposit facility to commercial banks (since 1996), and (until their termination in May 2000) through auctions of certificates of deposit (Nenovsky, Hristov, and Mihaylov 2002). In practice, the monetary authorities have made very limited use of their residual monetary discretion. In its day-to-day operations, the Bank of Estonia has increasingly relied on interest rate fluctuations to act as an automatic stabilizer for the currency board.

10.3 Monetary and Banking Policies

While the currency board brought a measure of macroeconomic stability, Estonia suffered a banking crisis soon after the introduction of the kroon and experienced several smaller crises during the 1990s.[3] During the 1992 crisis, distress in three major banks threatened to cause payments system difficulties, created a classic conflict between the internal objective of financial stability and the external objective of safeguarding the currency board. While its excess reserves provided the Bank of Estonia with some limited leeway to act as lender of last resort—which was utilized at various points during the period—they were insufficient to sidestep the fundamental trade-off.

As it turns out, the Bank of Estonia opted for maintaining the currency board. The troubled banks closed in November 1992. In succeeding years, Estonia continued to provide limited support within the rules of the game set by the currency board but demonstrated its willingness to allow banks to fail if this room for maneuver was exhausted.[4] As a consequence, the number of licensed banks fell from twenty-two in 1994 to six in 1998. Estonia thus provides a rare exception to the typical preference for the internal over the external objective (Bordo and Schwartz 1996).

10.4 Adjustments on the Way to EMU

Shortly after accession to the European Union in May 2004, Estonia entered ERM II, unilaterally maintaining its largely unchanged CBA arrangement (Nenovsky, Hristov, and Mihaylov 2002).[5] While the transition has been eased by more than a decade of good inflation performance under an independent central bank with established organization and decision-making structures, it has not been without challenges. On the institutional side, the development of a liquid domestic money market providing adequate scope for open market operations remains an issue (Bank of Estonia 2005). As Ross and Lättemäe (2004) stress, however, the practical need for domestic open market capacities prior to the introduction of the euro is limited. The large degree of foreign ownership in the Estonian banking sector[6] further reduces the need to establish a deeper interbank market involving the national central bank as foreign-owned banks are less likely to rely on the domestic money market for refinancing and are likely to receive liquidity support from their headquarters.

10.5 Performance

Figure 10.1 depicts the evolution of key macroeconomic variables in the five years preceding and following the introduction of the currency board in 1992. In the case of Estonia, the board was introduced against the background of rising inflation in the ruble zone and declining GDP reflecting the collapse of the CMEA. The introduction of the currency board worked as advertised. Inflation, which had reached four-digit levels in 1992, came down rapidly, while the rate of decline of output decelerated markedly, turning to positive growth rates by the mid-1990s. Since 1995, Estonia's income per capita in purchasing power parity (PPP) terms has increased from 32 percent to 46 percent of the EU-15 level (International Monetary Fund 2005d).

The turnaround in overall activity is matched by dynamic export performance, with growth rates averaging about 40 percent per year in the five years following the introduction of the currency board. As was the case in many other transition economies, Estonia has persistently recorded large current account deficits—financed largely by inward flows of foreign direct investment intent on taking advantage of the highly educated labor force and an undervalued real exchange rate in a country that was on the doorstep of the European Union.

The strong export growth came despite an initial sustained real appreciation—cumulative, some 80 percent during the 1992–1997 period. The combination of strong export growth and sharp real appreciation suggests that the initial parity was undervalued (Burgess, Fabrizio, and Xiao 2003), contributing to a declining but positive inflation differential in the initial years (figure 10.2). The conjecture is supported by calculations by the Bank of Estonia suggesting that the kroon never ventured significantly above its equilibrium level during the 1990s (Sepp and Randveer 2002). The objective of reorienting trade toward western Europe—motivating the choice of the deutsche mark rather than the U.S. dollar (the initial anchor in Lithuania) was achieved (De Haan, Berger, and van Fraassen 2001; Ross and Lättemäe 2004). By the end of 1998, the European Union accounted for almost 70 percent of total exports with the euro area alone absorbing about 40 percent. By 2003, following the Russian crisis, the EU's share had increased to about 75 percent, with the euro area's share rising to about 45 percent of the total.

Having survived the initial banking sector weakness, the Asian and the Russian crises of the late 1990s posed the next test for the kroon's

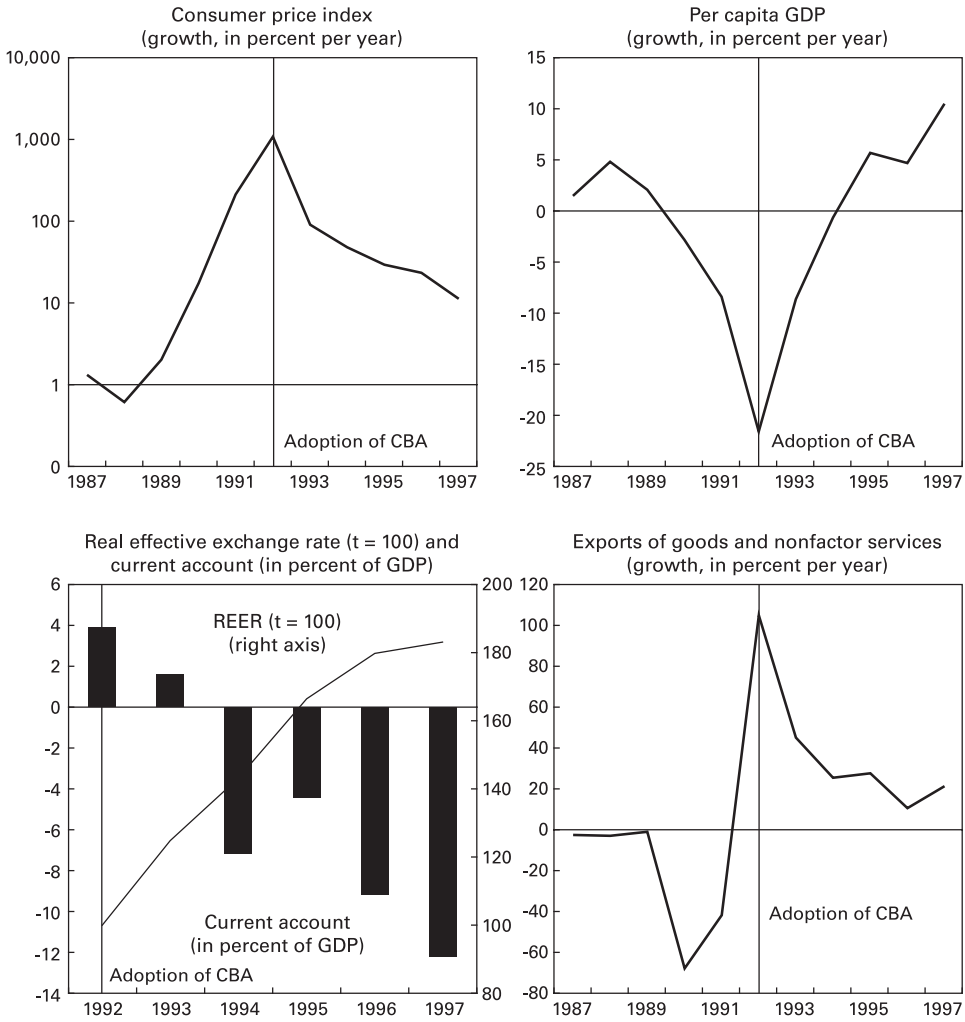


Figure 10.1
Estonia: Macroeconomic performance, pre- and post-currency board
Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.

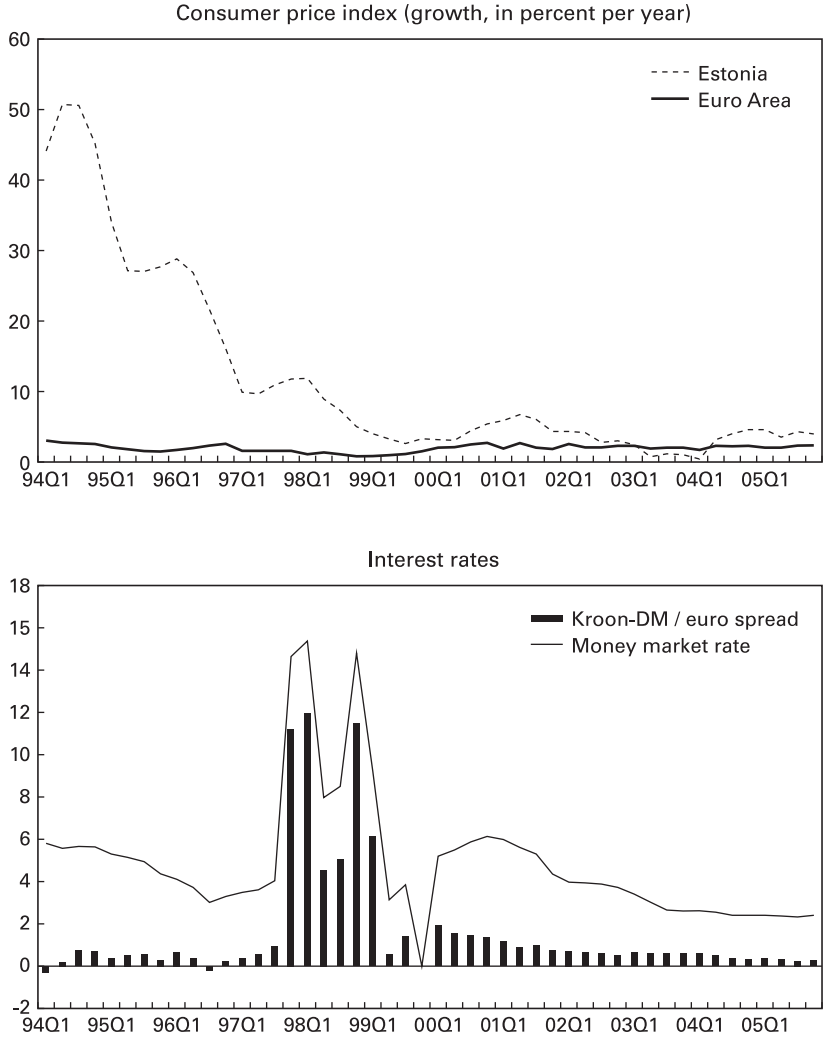


Figure 10.2
Estonia: Inflation, and interest rates after the adoption of the CBA
Sources: Authorities; International Monetary Fund; WEO database; and authors' estimates.

peg. The 1997 Asian crisis affected Estonia primarily through declining capital inflows, constraining credit and contributing to a significant fall in asset prices (Sepp and Randveer 2002). The resulting rise in short-term interest rates temporarily reversed the trend decline in the interest differential to Germany; the spread rose from less than 1.5 percentage points on the eve of the Asian crisis to more than 8 percentage points in late 1997 and early 1998 (figure 10.2).

Just as the Asian crisis began to abate, Estonia was hit much closer to home by the Russian crisis in the summer of 1998 affecting both trade and capital flows. Real growth slowed sharply in 1998 before turning marginally negative in 1999 (figure 10.1; see the appendix) as trade with Russia dropped by as much as 40 percent (Sepp and Randveer 2002), though the current account deficit narrowed as imports shrank with the contraction in economic activity. As pressures mounted, Eesti Pank found itself forced to increase interest rates (figure 10.2), again widening the differential with German rates. The combination of high interest rates and capital outflows placed further stress on credit and money growth. As the nominal money stock contracted for the first time since 1993, banking sector difficulties emerged in the second half of 1998, further troubling the already faltering real economy.[7]

However, the interest rate response proved sufficient to ward off the 1998 attack, just as it had ended the attack in the previous year. The survival of Estonia's currency board in these troubled times reflected the credibility of the arrangement, and reinforced it. As pressures against the Argentinean currency board mounted in 2001, there was little impact on the Estonian board, nor did the collapse of Argentina in 2002 have any noticeable ripple effects (figure 10.2). The strong performance can be partly credited to supportive fiscal policy.[8] An array of budgetary measures moved the fiscal position from deficit to surplus in 1997 and secured a close-to-balanced budget in 1998. Deficits returned briefly in 1999 as revenues deteriorated in the wake of the Russian crisis; however, this provided some welcome countercyclical momentum at a time when the output gap was widening (Sepp and Randveer 2002).

The two crises did not interrupt the gradual progress toward inflation convergence, largely completed by the millennium even as growth began to pick up again (figure 10.2). The trend decline of the inflation rate has been supported by extensive structural reforms. With the exception of the minimum wage and unemployment benefits—both of which are set at low rates—few impediments to flexibility in wage

setting exist. Vesilind and Rell (2000) show that during the period 1996–1999, wages in the tradable sector reacted very flexibly to changes in real activity, allowing for a sharp absolute decline in wages and falling unit labor costs in the aftermath of the Russian crisis.[9]

10.6 Joining the Eurozone

Estonia satisfies the fiscal criteria for Eurozone membership. But reflecting rapid growth, the Balassa-Samuelson effect coupled with Estonia's exposure to energy price shocks has driven the inflation rate above the Maastricht threshold; as a result, Estonia did not apply for 2007 Eurozone membership. Continued strong export performance suggests that the higher inflation has not yet led to a competitiveness problem. If inflation pressures can be contained, Estonia looks set to meet all the Eurozone membership criteria in the near future.[10] Provided Estonia maintains a high degree of flexibility in both product and labor markets, present trends suggest that the transition to (and operation under) the euro should be smooth.

Appendix

Table 10A.1 provides selected macroeconomic indicators covering the adoption and early years of Estonia's currency board regime.

Table 10A.1
Estonia: Selected macroeconomic indicators, 1992–2005

	1992[a]	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Real GDP growth (in percent per year)	−21.6	−5.7	−1.6	4.5	4.4	11.1	4.4	0.3	7.9	6.5	7.2	6.7	7.8	9.8
Real GDP per capita growth (in percent per year)	−20.4	−3.0	0.6	6.6	6.1	12.6	5.4	1.3	8.4	6.9	7.7	7.1	8.2	10.1
Unemployment rate	4.8	6.5	7.6	9.7	10.0	9.6	9.8	12.2	13.7	12.6	10.3	10.0	9.7	7.9
Inflation (average of period)	1075.9	89.8	47.7	29.0	23.1	11.2	8.2	3.3	4.0	5.8	3.6	1.3	3.0	4.1
Inflation (end-of-period)	7709776.2	37.9	−6.8	28.9	14.8	12.5	4.3	3.9	5.1	4.2	2.7	1.1	5.0	3.6
Broad money (growth, in percent per year)	68.5	57.8	29.6	40.4	36.8	44.6	4.2	23.7	25.7	23.0	11.2	10.9	15.8	41.9
Broad money (in percent of GDP)	29.3	24.9	23.5	24.0	25.3	29.8	27.3	32.3	35.7	39.1	38.8	39.5	41.2	50.1
Reserve money (growth, in percent per year)	166.1	103.3	11.6	19.9	22.2	37.7	6.4	26.7	14.9	−9.8	−1.5	14.6	24.0	33.0
Reserve money (in percent of GDP)	15.1	16.6	13.5	11.8	11.1	12.4	11.6	14.1	14.2	11.4	10.0	10.6	11.8	13.4
Net foreign assets (in percent of reserve money)[b]	156.3	97.9	95.4	96.3	103.1	114.6	115.7	112.5	114.8	120.2	126.9	124.2	120.7	116.1
Foreign currency deposits (in percent of deposits)	—	—	—	—	—	—	—	31.1	34.0	30.1	28.7	26.4	28.7	—
Foreign currency loans (in percent of deposits)	—	—	—	—	—	—	—	76.1	77.9	78.7	82.6	81.9	80.2	—
Money market rate (percent per annum)	—	—	5.7	4.9	3.5	6.4	11.7	5.4	5.7	5.3	3.9	2.9	2.5	2.4
Deposit rate (percent per annum)	—	—	11.5	8.7	6.1	6.2	8.1	4.2	3.8	4.0	2.7	2.4	2.2	2.1
General government balance (in percent of GDP)	−0.3	−0.6	1.2	−1.2	−1.8	2.1	−0.3	−4.3	−0.6	0.4	1.4	2.9	1.7	1.7

Table 10A.1
(continued)

	1992[a]	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Central government balance (in percent of GDP)	0.4	−0.7	−1.2	−1.2	−0.2	2.0	−0.4	−2.6	−0.1	0.4	0.5	2.2	1.9	1.9
General government, net debt (in percent of GDP)	—	—	—	—	7.5	5.2	3.9	4.0	2.8	1.0	−0.6	−0.9	−1.1	−3.8
Central government, net debt (in percent of GDP)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Exports of goods and services (in percent of GDP)	65.2	62.5	71.7	68.4	63.0	73.2	75.1	72.1	88.1	83.8	74.1	74.2	78.4	83.8
Exports of goods and services (real growth, in percent per year)	105.2	76.2	3.5	5.4	2.7	29.2	12.0	0.8	28.4	−0.2	0.8	5.8	16.0	21.3
Imports of goods and services (in percent of GDP)	70.0	66.4	82.1	76.0	73.8	84.0	84.9	76.7	91.9	87.3	81.2	81.8	86.8	90.2
Imports of goods and services (real growth, in percent per year)	158.2	78.0	11.2	6.3	7.6	29.2	12.6	−5.4	28.1	2.1	3.8	10.6	14.6	17.4
Current account balance (in percent of GDP)	3.9	1.2	−6.8	−4.2	−8.6	−11.4	−8.7	−4.4	−5.5	−5.6	−10.2	−12.1	−13.0	−10.7
Direct investment, net (in percent of GDP)	8.4	8.9	8.9	5.3	2.4	2.6	10.2	3.9	6.0	5.6	2.2	8.4	6.9	17.7
Reserves at year-end (in percent of GDP)	18.3	22.4	18.4	15.5	13.7	15.3	14.6	15.3	16.8	13.7	14.2	15.0	15.9	16.6
External debt, total (in percent of GDP)	2.8	4.8	4.6	4.3	33.6	53.6	50.3	54.8	54.4	55.5	60.1	68.7	74.9	86.7

Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.
[a] The currency board began operation on June 20, 1992.
[b] Defined as gross foreign assets minus liabilities, may differ from definition of reserves used for currency board coverage purposes.

11 Lithuania

Using the stability of the litas as a measure of our policy, we have earned public confidence that is very important. The Bank of Lithuania appreciates and treasures this confidence, and does not intend to take action that could ruin it.

—Arvydas Kregždė, "Lithuania's Strategy to Exit the Currency Board"

11.1 Introduction

Upon declaring independence in March 1990, Lithuania upgraded the local branch of the Gosbank into its new central bank.[1] The Bank of Lithuania[2] initially operated within the broader ruble area, struggling to establish monetary control. Although a currency board was considered as one option (Schuler, Selgin, and Sinkey 1991), it was not adopted. In the following years, Lithuania struggled to tackle rising inflation rates under the ruble system. The switch to a temporary national currency (talonas) in October 1992 initially did not break the inflationary momentum. The less-than-stellar inflation performance—notably in comparison with Estonia—became increasingly seen as an obstacle to the desired introduction of a permanent new national currency (litas), eventually leading the Bank of Lithuania to tighten monetary policy. The ensuing sharp decline in inflation rates allowed the switch to the litas in June 1993 (figure 11.1).

At this point, the future monetary regime became the focus of a lively debate (Camard 1996). The discussion pitted advocates of a hard peg (including the government) who pointed to the success of the Estonian currency board against skeptics (including, initially, the Bank of Lithuania itself), arguing that the Bank of Lithuania's recent success at disinflation demonstrated its capacity to pursue low inflation within an active monetary policy framework. In the end, the CBA proponents

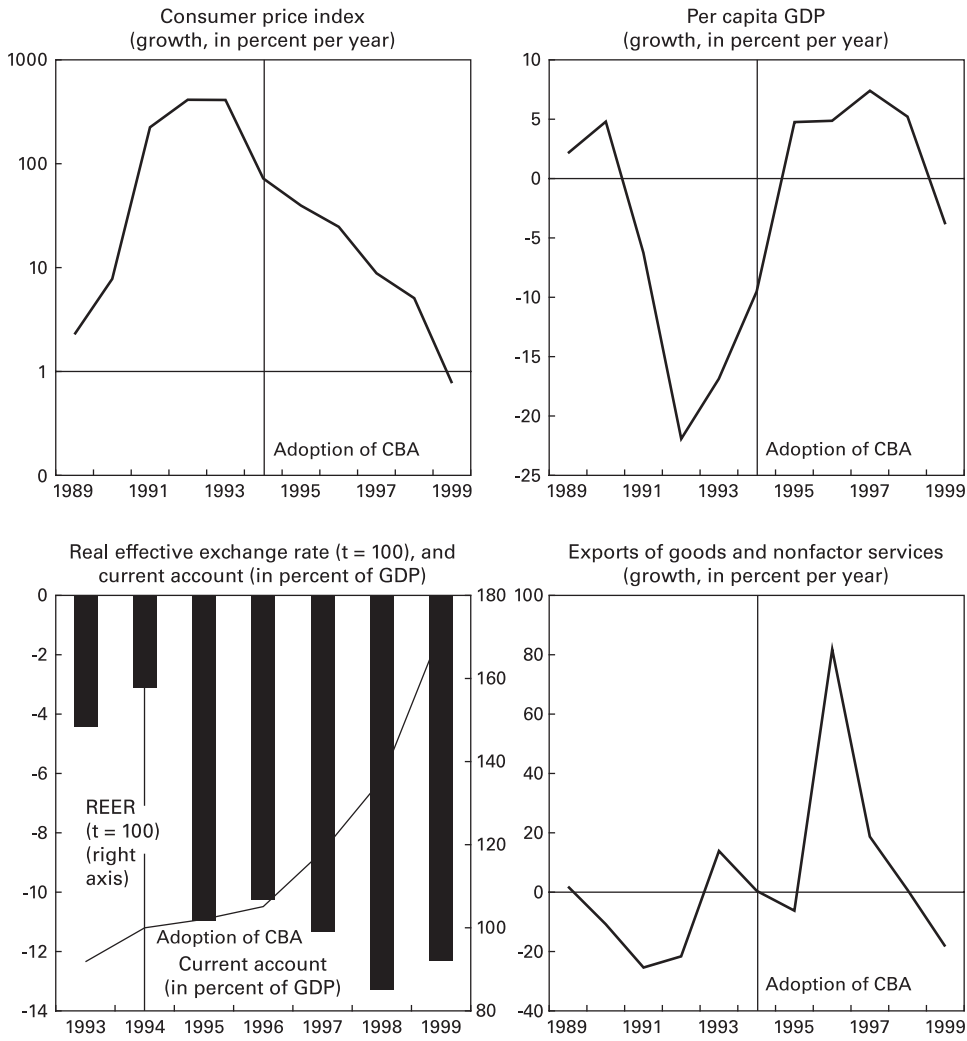


Figure 11.1
Lithuania: Macroeconomic performance, pre- and post-currency board
Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.

prevailed; on April 1, 1994, Lithuania switched to a currency board arrangement embedded within the Bank of Lithuania, based on the litas at a rate of four litas per U.S. dollar.[3]

The introduction was a success, contributing to sizable capital inflows aiding in the remonetization of the Lithuanian economy. Nonetheless, the merits of the currency board remained under discussion, in marked contrast to Estonia. While a consensus supported the board for the near term, views on its longer-term desirability diverged. For a while, the dominant view favored an eventual exit from the regime, and the Bank of Lithuania Monetary Policy Program for 1997–1999 (published in January 1997) envisaged a gradual exit from the currency board toward a traditional peg. In the event, a domestic banking crisis, followed by the repercussions of the Russian crisis, forced a postponement of the exit.

As economic performance and clarity on the timing of EU membership improved, the exit option was shelved again in favor of retaining the currency board until Lithuania would be able to join the Eurozone. Reflecting this reorientation, the currency board was rebased in February 2002 on the euro. Lithuania joined the European Union on May 1, 2004, followed by entry into ERM-II on June 28, 2004, under the general principles, but with a unilateral commitment to maintaining the currency board. In 2006, Lithuania applied for Eurozone membership. The Convergence Report found that Lithuania satisfied all but the inflation criteria, leading to the rejection of Lithuania's application. The rejection, based on a very narrow violation of the inflation criterion, was controversial both in light of a perception of more generous interpretations of (in particular, the fiscal) criteria for previous entrants and because the violation of the criterion reflected the particularly low inflation rate of non-Eurozone EU members. Subject to satisfying the inflation criterion, Lithuania is likely to enter the Eurozone in the next few years.

11.2 Structure

The Lithuanian monetary system is defined jointly by the 1994 Litas Credibility Law (LCL) introducing the currency board, and the earlier Law of the Bank of Lithuania. In its final form, the LCL grants the Bank of Lithuania the authority (in coordination with the government) to determine the anchor currency and the official exchange rate; it initally prohibited any future changes in either anchor currency or

exchange rate except in extraordinary circumstances threatening the stability of the economy. The restriction on altering the anchor currency was later relaxed to allow a switch to the euro. The initial choice of the U.S. dollar as the anchor currency reflected the dominance of the dollar in external trade: at the time of adoption more than 90 percent of trade (including all trade with the Commonwealth of Independent States (CIS) together with oil imports) were denominated in U.S. dollars—as well as widespread dollarization of savings and of economic transactions within the country.

The law requires gross reserves to cover "litas in circulation," defined to include notes, coins, as well as all short-term liabilities of the central bank. Initially, net reserves of the Bank of Lithuania were insufficient to back the approximately US$330 million in liabilities (Camard 1996, 7). To achieve full backing, reserves were augmented by a long-term IMF loan, with the intention of gradually increasing the net reserve backing through retained seigniorage revenue. The Lithuanian currency board commenced operations with excess gross reserves of US$70 million (Camard 1996, 9), or about 20 percent of the liabilities, allowing the Bank of Lithuania substantial leeway to act as lender of last resort.[4]

The Bank of Lithuania kept a number of monetary instruments—including reserve requirements on commercial bank accounts, the ability to provide overnight loans to ensure settlement in the payments system, rediscount operations with commercial banks, and open market operations.[5] The decision to retain this unusually large portfolio of instruments was partly motivated by concerns about financial stability; partly it reflected doubts about the desired permanency of the CBA.

Apart from the unusual degree of potential monetary policy flexibility, the Lithuanian currency board regime exhibits two further unorthodox features. The Bank of Lithuania continues to operate the interbank settlement system (litas), a function it assumed prior to the introduction of the currency board. The decision to leave this function with the Bank of Lithuania stemmed from a lack of realistic alternatives and a desire to retain the expertise in the Bank of Lithuania. The system is scheduled to integrate with TARGET2 (the payment system of all members of the euro system) in late 2007 or 2008. In the course of establishing a unified treasury account the Bank of Lithuania in 2002 also assumed the function of the government's banker, previously performed by private banks. Overall, the design of the Lithuanian currency board thus deviates from the orthodox structure in several aspects, notably in retaining a substantial degree of flexibility

to conduct monetary policy and in the use of gross rather than net reserves. Based on these features, Camilleri Gilson (2004) ranks Lithuania as the least restrictive CBA introduced in the 1990s.

11.3 Monetary and Banking Policies

Following the adoption of the currency board, the health of the Lithuanian banking system took a turn for the worse. From late 1994 through 1996, a number of small- and medium-sized banks faced liquidity problems. In the wake of weakening confidence, more than a quarter of household deposits were withdrawn. Financial distress combined with doubt about the authorities' commitment to the CBA[6] (reinforced by recurrent rumors about an impending devaluation) contributed to significant capital outflows.

Attempts by the government and the Bank of Lithuania to address banking sector problems were restricted by the LOLR limits imposed by the currency board regime.[7] Central bank support consequently remained far below the figures seen in other banking crises.[8] A decisive response to the emerging crisis was further restrained by uncertainty about the relative responsibilities of the government and the central bank for maintaining stability of the financial system. While in the end the immediate crisis was halted in February 1995 through a public recommitment to the CBA at its original par, there was damage to the credibility of the system—as reflected in higher interest rates (figure 11.2).

The political standoff was eventually resolved through a change in the leadership of both government and central bank, with a subsequent agreement that the government would have to take the lead in resolving banking crises under the CBA. A comprehensive restructuring plan—including a recapitalization or closure of all weak banks over a three-month period, a time-limited full guarantee of deposits and interbank loans, and the creation of a deposit insurance agency and of an asset management company to resolve the failed banks—put the banking system on the road to recovery. While the resolution did not come cheap at an estimated total cost of 3.5 percent of GDP (particularly considering Lithuania's relatively low level of monetization), it was successful. By 1998 the profitability of the banking sector had been restored. Thereafter, lesser problems with individual banks were successfully resolved in the new institutional framework without notable contagion to other banks. However, the resolution of the banking crises has resulted both in a relatively concentrated banking system

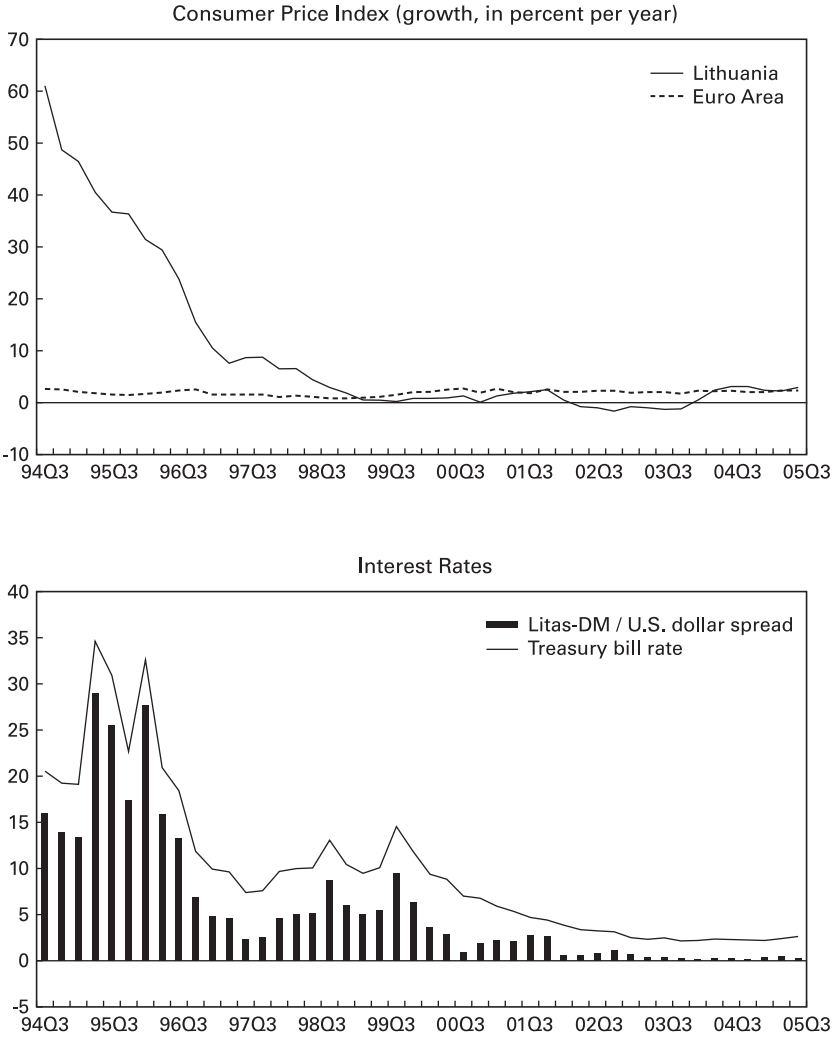


Figure 11.2
Lithuania: Inflation, and interest rates after the adoption of the CBA
Sources: Authorities; International Monetary Fund; WEO database; and authors' estimates.

and in a large role played by foreign banks. The three largest banks, all foreign owned, account for 70 percent of banking system assets; in total, foreigners hold almost 90 percent of banking system capital.

Credit has matched rapid economic expansion, with growth rates exceeding 30 percent in several years. While the Bank of Lithuania monitors credit growth closely, prudential indicators to date do not seem to indicate that loan quality has been compromised. In fact, the ratio of nonperforming loans to total loans has declined from 8.2 percent in 2001 to 2.3 percent in 2004; a review in the context of the Financial Sector Assessment Program (FSAP) and subsequent Article IV discussions with the IMF did not identify major financial-sector soundness problems.

11.4 The Exit Debate and Preparation for EMU

In contrast to the largely unchallenged support for the CBA in Estonia, support for the currency board in Lithuania remained lukewarm in its early years. The authorities publicly stated their goal of eventually exiting to a basket peg with equal weights for the U.S. dollar and the euro, and prepared for the exit through the creation and retention of monetary policy instruments.[9]

However, the intended exit was repeatedly interrupted, first by the 1994–1996 banking crisis, then by the repercussions of external financial crises. The effects of the Russian crisis in particular, which contributed to a 4 percent decline in Lithuania's real GDP during 1999, led to a worsening fiscal balance, a sharply rising interest differential, and strains in the government securities markets. This damaged confidence in the litas, leading to growing currency substitution. In contrast to the crisis a few years earlier, however, no significant bank runs occurred.

The confidence crisis pushed the exit question to the forefront. Would an exit, perhaps coupled with a devaluation, reinvigorate export growth without harming inflation performance? Or would markets interpret the exit as signaling the end of the hard money policy? The new government taking office in November 1999 took a skeptical view of the benefits of exiting the CBA, shelving the exit option in favor of maintaining the exchange rate regime until Lithuania could enter ERM-II.[10] The recommitment was complemented by fiscal reforms that reduced the budget deficit to 2.8 percent of GDP and by a series of structural reforms including a freshly invigorated privatization program. This set of measures succeeded in repairing credibility.

Capital outflows reversed, assisting a resumption of rapid growth and buttressing Lithuania's position during the EU membership negotiations.

On its way to becoming a member of the Eurozone, Lithuania now faced the additional challenge of shifting the anchor from the U.S. dollar to the euro.[11] To prepare markets, the Bank of Lithuania announced in late 1999 that a shift would eventually take place, with details to be published by 2001. The lack of specificity in the announcement, coupled with the ongoing appreciation of the U.S. dollar, fueled rumors that the repegging might be coupled with a devaluation, forcing a further clarification by the Bank of Lithuania that the conversion would take place at the market exchange rate. The date of repegging (February 2, 2002) and the conversion rate—the euro/dollar reference rate published by the ECB on February 1, 2002—was preannounced in June 2001, thus providing the private sector time to prepare. The announcement was well received, with no sharp effect on eurobond rates. The conversion itself went smoothly, with Bank of Lithuania foreign assets being converted into euros and new bank lending quickly shifting to euros. The adjustment in household savings was less rapid and complete, the dominant share of private foreign currency deposits initially continued to be held in U.S. dollars, but by now euro deposits dominate.

Following the change in anchor and legal adjustments to the Law of the Bank of Lithuania, the currency board operated smoothly through the run-up to EU membership on May 1, 2004.[12] On June 27, 2004, Lithuania joined the ERM II system, with a unilateral commitment to maintain the exchange rate within the 0 percent band defined by the CBA rather than the broader $+/-15$ percent range allowed under ERM-II.

11.5 Performance

The decline in inflation that began with the Bank of Lithuania's shift toward more restrictive policies accelerated after the introduction of the currency board. Inflation declined from more than 70 percent in 1994 to less than 3 percent in 1998 (figure 11.1). Through 2005 it remained in the low single digits (table 11A.1) and at times below zero. Recently, inflation has increased, partly reflecting energy and food price increases, and inflation currently stands above the Eurozone average (European Central Bank 2006, 34).[13] Whether the increase is best

viewed as a one-time increase in the price level or as a harbinger of sustained higher inflation remains under debate (Bonato and Leigh 2005; IMF 2007; European Central Bank 2006). A recent IMF assessment (International Monetary Fund 2006) concludes that while external factors—notably the increase in energy prices and EU accession (leading to excise tax increases)—have contributed, demand-induced inflation in nontradables is playing an increasingly important role. The persistence of the latter factor suggests that the recent increase in Lithuania's inflation may have a more permanent effect.

Reflecting the improving inflation performance, Lithuania has witnessed a substantial remonetization since the introduction of the currency board regime. The process has continued and even accelerated recently; in the last five years, annual growth of real broad money has exceeded 15 percent. Gross reserves have increased apace, and the coverage ratio relative to litas in circulation, at about 140 percent, continues to provide the Bank of Lithuania with flexibility.

On the output side, a post-stabilization period of rapid recovery was followed by decline in the aftermath of the Russian crisis and a later rebound under the reaffirmed CBA; in recent years growth rates have consistently been among the highest in Europe, comfortably exceeding 6 percent per year since 2001. With a small caveat concerning the effect of further energy price increases, the strong growth performance is expected to continue for the next few years; the IMF estimates the potential medium-term growth rate at around 5.5–6 percent per year. Growth is supported by strong domestic and foreign direct investment, with the total investment ratio approaching 25 percent of GDP. Strong growth has gradually reduced the unemployment rate, though it remains in the double digits.

Externally, the real exchange rate experienced strong appreciation in the immediate aftermath of the CBA before stabilizing, and then for a time depreciating. Since 1999, real exchange rate movements have been more muted (European Central Bank 2006, 40). The continued strong export performance suggests that the appreciation commenced from an undervalued level (Burgess, Fabrizio, and Xiao 2003). The late 1990s witnessed a sharp decline in exports in the wake of the Russian crisis; this episode also marks the shift in the shares from dollar- to euro-denominated trade. Persistently large current account deficits remain an issue. The deficits primarily reflect a large gap between a steadily rising investment ratio—reaching 24 percent of GDP—and a steadily declining savings rate, dipping slightly below 15 percent.

Concerns about the imbalance—currently exceeding 9 percent—are tempered by the availability of net transfers from the EU and—to date—strong net FDI inflows.

11.6 EMU Accession

Lithuania has declared its intention to adopt the euro as soon as possible (Zabuliene 2005). At Lithuania's request, the ECB published a convergence assessment in May 2006. The report (ECB 2006) concludes favorably on the two-year exchange rate stability criterion and—following a revision of the Lithuanian Constitution and the Law on "Lietuvos Bankas"—the legal structures. With an expected 2006 deficit of 0.6 percent and a 2006 debt-to-GDP ratio of 18.9 percent, Lithuania easily passed the fiscal conditions as well (ECB 2006, 36). Following sustained convergence with euro area rates (figure 11.2), long-term rates, at 3.7 percent over the last year, were likewise well under the reference value of 5.9 percent per year. Partly reflecting the Balassa-Samuelson effects of rapid productivity growth and exposure to energy prices,[14] however, Lithuania narrowly failed the inflation criterion and found its application rejected.

Looking forward, the likely further adjustment of gas prices will generate additional exogenous inflation shocks. The ECB has expressed concern that in an environment of tight labor markets, these price level changes could translate into persistent inflation (European Central Bank 2006, 8). The finding of increasingly important inflation impulses from the nontraded sector (International Monetary Fund 2006) points in the same direction. The timing of Eurozone membership depends on Lithuania's ability to contain these inflation pressures.

Appendix

Table 11A.1 provides selected macroeconomic indicators covering the adoption and early years of Lithuania's currency board regime.

Table 11A.1
Lithuania: Selected macroeconomic indicators, 1992–2005

	1992	1993	1994[a]	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Real GDP growth (in percent per year)	−21.3	−16.2	−9.8	3.3	4.7	7.0	7.3	−1.7	4.7	6.4	6.8	10.5	7.0	7.5
Real GDP per capita growth (in percent per year)	−21.9	−16.9	−9.5	4.8	8.0	7.8	8.1	−1.0	5.0	7.2	7.1	10.9	7.5	8.1
Unemployment rate	1.3	4.6	3.9	6.4	7.1	5.9	16.4	14.6	16.4	17.4	13.8	12.4	11.3	8.3
Inflation (average of period)	413.6	410.4	72.1	39.5	24.7	10.3	5.4	1.5	1.1	1.6	0.3	−1.1	1.2	2.7
Inflation (end-of-period)	—	188.4	44.9	35.7	14.9	8.5	3.1	0.4	1.6	2.1	−0.9	−1.3	2.8	3.0
Broad money (growth, in percent per year)	745.3	100.4	63.0	29.0	−3.5	34.1	32.4	7.7	16.5	21.4	16.9	18.2	24.1	32.9
Broad money (in percent of GDP)	33.1	19.5	21.8	19.0	14.5	16.0	18.8	20.7	22.8	26.1	28.6	30.9	34.9	40.7
Reserve money (growth, in percent per year)	—	203.7	44.2	35.0	2.2	32.4	28.8	−4.0	−3.3	8.3	20.8	26.6	7.1	27.6
Reserve money (in percent of GDP)	11.9	10.6	10.5	9.6	7.7	8.4	9.6	9.4	8.6	8.8	9.9	11.5	11.2	12.6
Net foreign assets (in percent of reserve money)[b]	123.8	105.3	95.3	91.5	89.9	96.0	113.5	99.2	116.6	135.9	142.0	139.7	127.9	123.4
Credit to private sector (growth, in percent per year)	—	—	—	—	—	—	—	13.8	−6.1	6.3	30.4	58.8	39.8	—
Nonperforming loans (in percent of banking sector assets)	—	—	—	—	—	—	—	12.5	11.3	8.2	6.5	3.0	2.3	—
Money market rate (percent per annum)	—	—	69.5	26.7	20.3	9.6	6.1	6.3	3.6	3.4	2.2	1.8	1.5	2.0
Deposit rate (percent per annum)	—	88.3	48.4	20.1	13.9	7.9	6.0	4.9	3.9	3.0	1.7	1.3	1.2	—
General government balance (in percent of GDP)	0.5	−5.2	−4.8	−4.2	−4.4	−1.8	−5.7	−8.4	−4.0	−2.1	−1.4	−1.7	−2.5	−1.2

Table 11A.1
(continued)

	1992	1993	1994[a]	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Central government balance (in percent of GDP)	0.5	−5.2	−4.8	−4.2	−4.4	−1.8	−5.7	−7.9	−3.9	−1.7	−1.5	−1.7	−2.7	−1.2
General government, net debt (in percent of GDP)	—	—	—	—	—	—	17.6	25.4	19.7	18.7	17.5	15.9	14.8	14.2
Central government, net debt (in percent of GDP)	—	—	—	—	—	—	17.9	25.1	20.0	18.9	17.7	16.2	15.3	14.7
Exports of goods and services (in percent of GDP)	64.9	72.2	53.3	37.6	52.2	53.1	45.7	39.1	44.6	49.8	53.2	51.4	52.3	58.4
Exports of goods and services (real growth, in percent per year)	—	—	—	—	19.4	18.6	4.6	−16.8	9.9	21.2	19.5	6.9	4.2	14.3
Imports of goods and services (in percent of GDP)	60.1	80.1	57.3	58.7	61.8	63.4	57.2	49.2	50.9	55.2	58.8	57.3	59.3	65.4
Imports of goods and services (real growth, in percent per year)	—	—	—	—	23.3	25.0	6.2	−12.4	4.8	17.6	17.7	10.3	14.8	15.9
Current account balance (in percent of GDP)	5.4	−7.4	−3.9	−10.7	−5.0	−7.9	−11.7	−11.0	−5.9	−4.7	−5.2	−6.9	−7.7	−6.9
Direct investment, net (in percent of GDP)	0.0	0.0	0.0	0.0	1.9	3.3	8.3	4.4	3.3	3.6	5.1	0.8	2.3	2.7
Reserves at year-end (in percent of GDP)	2.8	12.9	12.3	12.0	9.7	10.3	12.8	11.1	11.5	13.4	16.7	18.2	15.7	16.5
External debt, total (in percent of GDP)	5.1	10.1	10.3	11.8	29.6	33.1	33.7	41.8	42.4	43.4	43.9	45.0	46.6	48.7

Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.
[a] The currency board began operation on April 1, 1994.
[b] Defined as gross foreign assets minus liabilities, may differ from definition of reserves used for currency board coverage purposes.

12 Bulgaria

12.1 Introduction

In 1990, Bulgaria began its transition from centrally planned to market economy. Performance during the initial years was poor, hampered by the slow transformation of state-owned enterprises and the banking sector, both of which were being kept afloat through a combination of direct budgetary subsidies and bank loans refinanced by the Bulgarian National Bank. GDP declined sharply and by 1997 stood some 60 percent below its 1990 level, while inflation accelerated. In response to the steadily deteriorating situation, Bulgaria embarked on no fewer than four IMF-supported adjustment programs between 1991 and 1996. All but the first of these went offtrack.

A last attempt at a money-based stabilization program in 1996 was derailed by a looming banking crisis. Liquidity injections to support the banking system, coupled with continued central bank financing of a budget deficit having reached some 8 percent of GDP, pushed the economy over the brink. As foreign exchange reserves plummeted, the leva went into free fall, contributing to recurrent bank runs, while inflation spun out of control, reaching an annualized rate of 2,000 percent in the spring of 1997.

A currency board based stabilization, first suggested by the IMF in late 1996, was initially greeted with skepticism by the Bulgarian government, the public at large, as well as by many foreign observers. Critics cautioned that a CBA would impede servicing the large domestic debt and supporting the still fragile banking system should the need arise and pointed to the largely depleted foreign reserves. But, as monetary and political instability mounted, the use of a currency board to instill discipline and restore credibility gained appeal (Hristov and Zaimov 2002). At the time, inflation substantially reduced the real value of

the public debt outstanding, currency substitution and demonetization reduced the foreign exchange required for coverage, and banking system health was improved through a combination of closures and the beneficial balance sheet effects of the leva depreciation for those banks with substantial net foreign exchange positions.[1] The decisive political shift came with the election of a new government in April 1997, vowing support for a macroeconomic stabilization program based on a currency board.

With the support of the IMF, the new Bulgarian government drafted a new central bank law defining the essential parameters of the currency board, which was passed by Parliament on June 5, 1997. The currency board officially began operating on July 1, 1997, linking the leva to the deutsche mark at a rate of one thousand to one, later converted to leva 1.95583 per euro.

12.2 Structure and Operating Environment

In the run-up to the CBA-based stabilization, a number of designs were considered, including the creation of separate banking supervision and debt management institutions. But as the macroeconomic situation deteriorated, these more time-consuming options were shelved. Instead, the Bulgarian National Bank (BNB) was charged with operating the currency board alongside its other functions. However, in an attempt to enhance transparency, the new law divided the BNB into separate Issue, Banking, and Supervision Departments, each headed by a deputy governor. The functions of each of the departments are distinct, and relations among the three departments are limited.

The Issue Department fulfills the role of the currency board proper. It is responsible for the BNB's monetary liabilities, comprising bank notes and coins, deposits from the government, banks,[2] other nongovernmental depositors as well as deposits of the Banking Department. The Issue Department's liabilities must be fully backed by foreign exchange assets or gold. The Issue Department is obliged to buy or sell leva against the anchor currency at the specified rate to and from both banks and the public without limit.[3] To ensure adherence to the rules, the Issue Department's accounts are published weekly.[4]

Given the magnitude of fiscal problems at the time of the introduction of the CBA, it was clear that—even after reduction of the real domestic debt burden through hyperinflation—IMF resources would initially be needed for budget support. The BNB law therefore allows

the BNB to on-lend these funds under strict safeguards and transparency provisions. As is the case for most modern boards—with Bosnia and Herzegovina as the main exception—the Bulgarian currency board is thus based on a gross rather than a net reserves coverage requirement.

The Banking Department was created to house the remaining assets and liabilities of the central bank at the time of the creation of the board. These consist primarily of outstanding long-term loans to the government and banks and a long-term deposit by a commercial bank. The Banking Department also acts as the fiscal agent for Bulgaria's relations with the IMF. Furthermore, the Banking Department holds an earmarked foreign currency deposit at the Issue Department to provide it with the option of limited LOLR activities.[5] Banking Department assets and liabilities change if there are drawings from the IMF, if LOLR lending to commercial banks occurs, or as if the central bank makes profits or losses.[6]

The design of the Bulgarian board reflects a compromise between the desire for a transparent, credibility-enhancing currency board and the pragmatic need to retain certain central bank functions. The ability of the BNB to undertake (limited) LOLR operations, manage government accounts, and supervise the banking system as long as the coverage ratio is maintained creates some tensions avoided by orthodox arrangements such as the CBA implemented in Bosnia and Herzegovina.[7] Calls to tighten the design of the currency board to restrict the residual monetary policy flexibility have not found much resonance with policymakers or the public. The sanguine feeling partly reflects successful fiscal stabilization, in particular the creation of a fiscal reserves account (FRA) to eliminate the need for short-term loans to the fiscal authorities.[8]

12.3 Monetary and Banking Policies

With the introduction of the currency board, the BNB relinquished most of its monetary instruments, including the repo facility, as well as its regular lending operations to commercial banks and to the government. Aside from the limited LOLR operations based on excess reserves, the BNB, in conjunction with the government, retains limited scope to influence liquidity conditions, most importantly through changes in reserve requirements and changes in government deposits held at the issue department.[9] IMF lending channeled through the

BNB[10] also influences the level of liquidity. In respect to the latter two channels, the BNB plays a largely passive role, apart from short-run operational timing decisions.

The BNB was initially reluctant to use the flexibility provided by these instruments, but has recently become more active. Required reserves were used predominantly as a prudential tool. Initially set at 11 percent, reserve ratios were altered only once prior to 2004 to offset the contractionary effects on liquidity of the introduction of a single treasury account in the BNB and to bring rates closer to the lower requirements in the Eurozone (Berlemann, Hristov, and Nenovsky 2002).[11] The strong growth in private sector credit—which expanded by nearly 50 percent in 2003 and 2004—raised macroeconomic concerns and prompted the authorities to use prudential tools, including required reserves, for the dual purpose of assuring financial stability and managing domestic liquidity. While putting some limits on the growth in bank lending, these measures have been overwhelmed by sustained capital inflows stemming from firms directly borrowing abroad. In fall 2007, required reserves were raised to help control liquidity.

Banking policies focused on completing the restructuring of the sector initiated during the 1996–1997 banking crisis by finding strategic investors for all large state banks, including the savings bank holding the bulk of household deposits. As is the case in the other European CBAs, foreign ownership dominates in the banking system. By 2002 more than half of Bulgaria's thirty-five banks, accounting for two-thirds of all banking sector assets and including the three largest banks, were foreign owned.

12.4 Performance and Outlook

Since the 1996–1997 crisis, Bulgaria has achieved a remarkable turnaround (Gulde 1999), with EU membership in 2007 signaling the degree of change already accomplished. Figure 12.1 depicts Bulgaria's macroeconomic performance in the five years preceding and following the introduction of the currency board. The CBA delivered on the stabilization objective; the inflation rate has declined from hyperinflationary levels in 1997 to less than 20 percent in 1998 and less than 3 percent in 1999. Inflation has remained contained even though administrative price adjustments, wage pressures, and—most recently, buoyant demand—have kept rates slightly above Eurozone levels (Beck, Miller, and Saad 2005). Nominal interest rates slowly converged toward

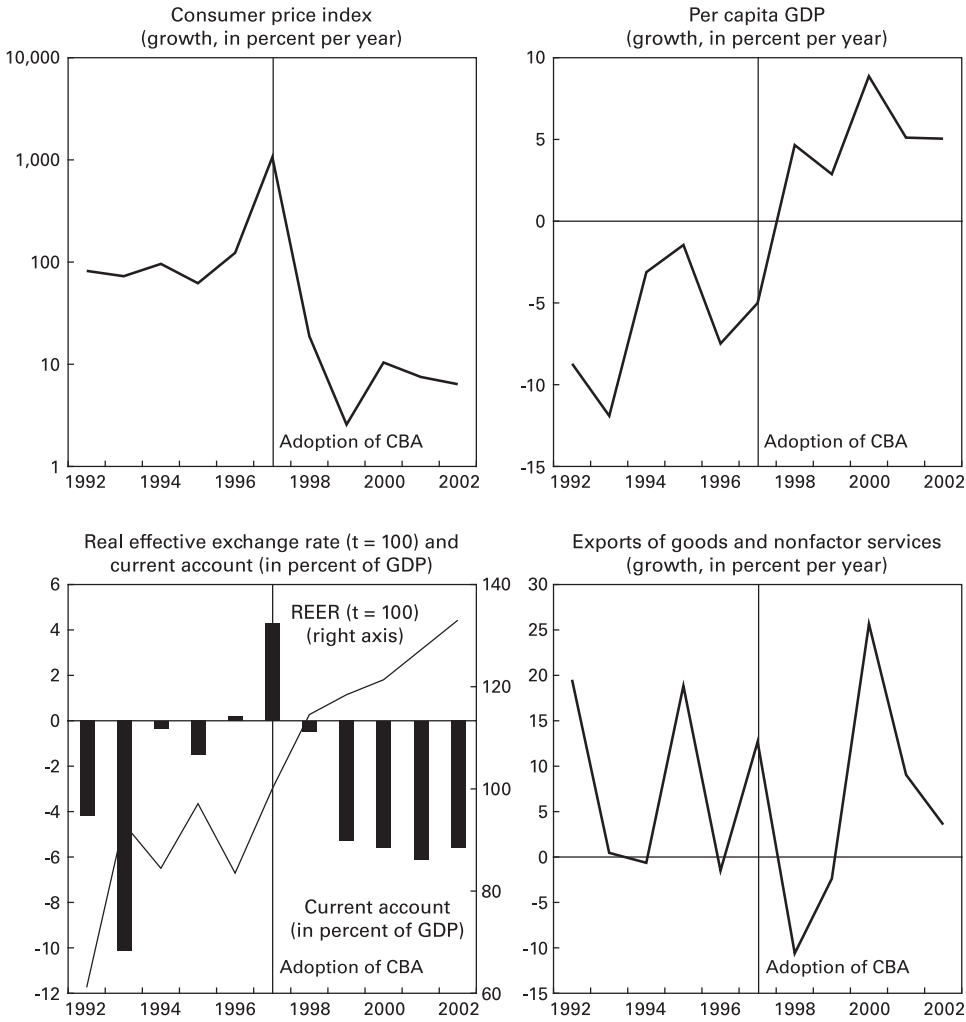


Figure 12.1
Bulgaria: Macroeconomic performance, pre- and post-currency board
Sources: International Monetary Fund; WEO, IFS databases.

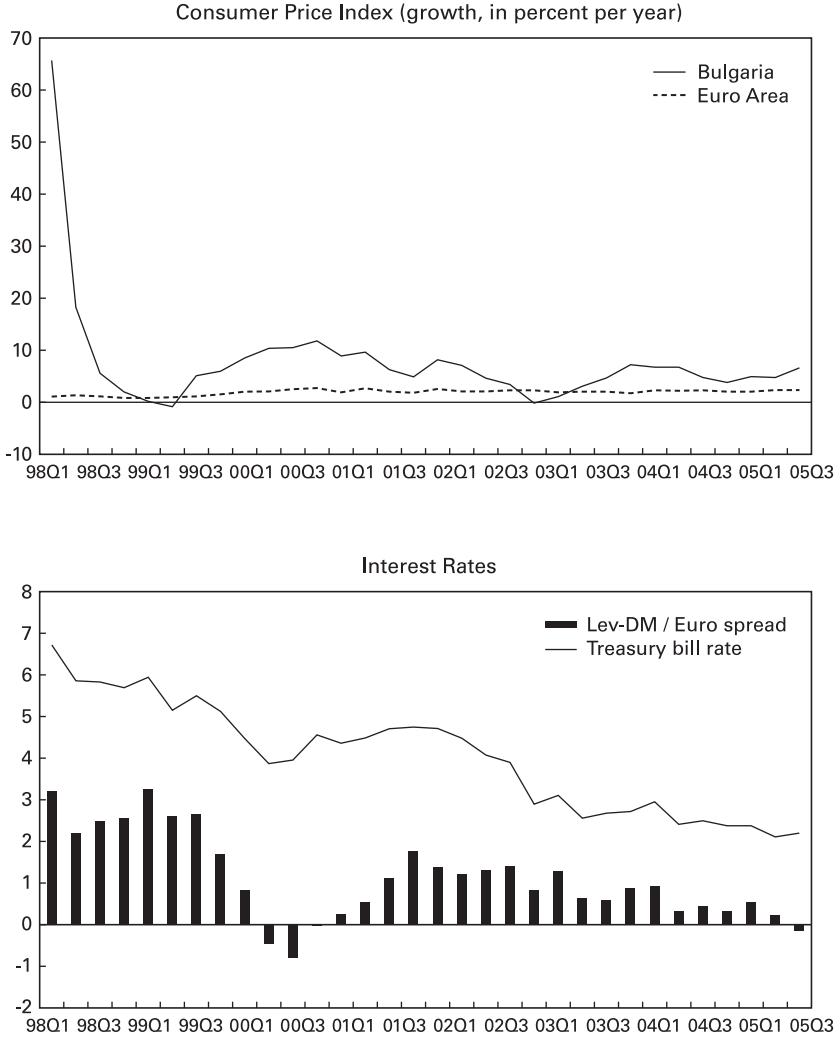


Figure 12.2
Bulgaria: Inflation, and interest rates after the adoption of the CBA
Sources: Authorities; International Monetary Fund; WEO database; and authors' estimates.

German levels (figure 12.2). Initially showing a persistent-positive (though declining) gap, interest rates recently have hovered close to the Eurozone levels.

Following the extended period of weakness preceding the adoption of the CBA, confidence in the banking system has rebounded in the wake of stable inflation and successful privatizations. Real broad money growth started accelerating in 2000; the ratio of broad money to GDP has nearly reached the 70 percent mark. Foreign currency deposits have stabilized but, at about 40 percent of broad money, remain high, reflecting ratchet effects and the low interest rate premium of the leva over Eurozone interest rates.

On the real side, output continued to decline in 1997, but growth rebounded to almost 5 percent in 1998 and has remained positive since even during the Asian and Russian crises and amid continuing regional instability,[12] though growth remains well below the levels enjoyed by Estonia and Lithuania.

Export growth resumed in 1998, one year after stabilization. Reflecting rapid import growth, the current account registered a deficit of 6 percent of GDP financed to a significant extent by FDI. In the most recent years, export growth accelerated in spite of slow growth in Bulgaria's principal export markets and real exchange rate appreciation, containing the deterioration in the external balance.[13]

12.5 Outlook and Adjustments on the Way to EMU

The Bulgarian currency board arrangement has helped deliver robust growth, low inflation, declining external and public debt ratios, and substantial gains in internal and external credibility (Valev and Carlson 2004; Valev 2005). Bulgaria has publicly stated its intention to retain the CBA through its eventual exit into the Eurozone.[14]

Several obstacles loom on this route. Strong capital inflows coupled with rapid domestic credit growth requires careful monitoring, while the experience of the Baltic CBAs demonstrates the difficulties of satisfying the inflation criteria even under a hard peg, especially if strong productivity growth results in increasing nontradables prices (Nenovsky and Dimitrova 2002).

Appendix

Table 12A.1 provides selected macroeconomic indicators covering the adoption and early years of Bulgaria's currency board regime.

Table 12A.1
Bulgaria: Selected macroeconomic indicators, 1992–2005

	1992	1993	1994	1995	1996	1997[a]	1998	1999	2000	2001	2002	2003	2004	2005
Real GDP growth (in percent per year)	−8.4	−11.6	−3.7	−1.6	−8.0	−5.6	4.0	2.3	5.4	4.1	4.9	4.5	5.7	5.5
Real GDP per capita growth (in percent per year)	−7.5	−10.7	−2.7	−0.7	−7.2	−4.8	4.7	3.0	6.1	4.8	5.6	5.2	6.4	6.3
Unemployment rate	13.2	15.8	14.1	11.4	11.0	14.0	12.4	13.8	18.1	17.5	17.4	14.2	12.7	11.5
Inflation (average of period)	82.0	72.8	96.0	62.1	123.0	1061.2	18.8	2.6	10.4	7.5	5.8	2.3	6.1	5.0
Inflation (end-of-period)	79.4	63.8	121.9	32.9	310.8	549.2	1.7	7.0	11.4	4.8	3.8	5.6	4.0	6.5
Broad money (growth, in percent per year)	53.6	47.6	78.6	39.6	124.5	359.4	9.6	14.2	30.8	25.8	11.7	19.6	23.1	23.9
Broad money (in percent of GDP)	79.0	78.3	79.5	66.3	74.4	34.5	29.4	31.7	36.8	41.7	42.9	48.0	53.3	60.2
Reserve money (growth, in percent per year)	50.7	22.0	55.9	52.0	91.5	826.7	10.2	17.6	11.1	30.4	8.0	16.1	40.2	12.4
Reserve money (in percent of GDP)	22.2	18.2	16.2	14.7	14.0	13.1	11.3	12.5	12.3	14.5	14.4	15.6	19.8	20.3
Net foreign assets (in percent of reserve money)[b]	19.8	3.0	24.2	44.0	−1.4	130.6	133.6	131.9	139.4	126.1	146.7	154.8	150.4	155.0
Credit to private sector (growth, in percent per year)	—	—	—	—	—	—	—	21.4	21.4	32.1	44.0	48.3	48.7	—
Nonperforming loans (in percent of banking sector assets)	—	—	—	—	—	—	—	11.7	8.3	13.1	8.6	7.3	7.0	—
Foreign currency deposits (in percent of deposits)	—	—	—	—	—	—	—	40.0	35.9	52.8	49.6	48.0	46.9	—
Foreign currency loans (in percent of deposits)	—	—	—	—	—	—	—	—	—	35.5	41.3	42.8	47.5	—

Money market rate (percent per annum)	52.4	48.1	66.4	53.1	119.9	66.4	2.5	2.9	3.0	3.7	2.5	2.0	1.9	2.0
Deposit rate (percent per annum)	45.0	42.6	51.1	35.9	74.7	46.8	3.0	3.2	3.1	2.9	2.8	2.9	3.0	3.0
General government balance (in percent of GDP)	−5.2	−10.9	−5.8	−5.6	−10.3	−2.0	0.9	−0.9	−1.0	−0.9	−0.8	−0.4	1.8	2.3
General government, net debt (in percent of GDP)	158.3	135.9	140.2	100.9	116.7	107.5	93.0	65.4	66.0	63.5	58.5	51.3	39.8	36.3
Exports of goods and services (in percent of GDP)	61.3	110.3	65.8	51.4	66.7	67.6	46.6	44.7	55.7	53.3	51.8	53.7	58.1	61.1
Exports of goods and services (real growth, in percent per year)	19.5	0.5	6.5	18.8	11.2	12.8	−4.7	−5.0	16.6	10.0	7.0	8.0	13.2	5.6
Imports of goods and services (in percent of GDP)	60.9	119.6	60.1	46.4	56.5	56.4	46.6	50.6	61.1	62.0	58.5	64.0	69.1	78.3
Imports of goods and services (real growth, in percent per year)	40.1	25.7	4.2	21.0	−2.8	10.9	12.1	9.3	18.6	14.8	4.9	15.3	14.2	12.4
Current account balance (in percent of GDP)	−4.4	−24.7	−0.4	−0.2	0.2	4.1	−0.5	−5.0	−5.6	−7.3	−2.4	−5.5	−5.8	−11.8
Direct investment, net (in percent of GDP)	0.5	0.9	1.3	0.8	1.4	4.9	4.2	6.2	8.0	5.9	5.8	10.3	5.6	10.7
Reserves at year-end (in percent of GDP)	11.6	15.8	13.5	9.8	5.4	21.0	21.4	22.8	25.4	24.6	28.6	31.8	36.4	36.1
External debt, total (in percent of GDP)	168.4	310.9	144.9	77.4	97.0	100.4	84.8	84.1	88.6	78.1	72.0	67.5	69.0	60.2

Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.
[a]The currency board began operation on July 1, 1997.
[b]Defined as gross foreign assets minus liabilities, may differ from definition of reserves used for currency board coverage purposes.

13 Bosnia and Herzegovina

There are lots of projects in BH for which a "little bit" of CBBH finance may be helpful. But the problem would be in keeping the CBBH credit to a "little bit." The experience of the region is that excess central bank credit has usually been created and the result is inflation. That does not help business, employment, or confidence in BH. So in my view, the strict Currency Board is the best approach for BH.

—Peter Nicholl, "Perspectives on Monetary Policy in Bosnia and Herzegovina"

13.1 Introduction

After declaring independence in 1992, Bosnia and Herzegovina suffered through three years of ethnic conflict, ending with the 1995 Dayton Accord recognizing Bosnia and Herzegovina as a single country consisting of two entities—the Federation of Bosnia and Herzegovina and the Republika Srpska.

Establishing monetary stability in a recently independent country struggling with the aftermath of war and characterized by deep mistrust among ethnic groups was a difficult challenge by itself; matters were further complicated by the accompanying transition from a planned to a market economy and the presence of multiple circulating currencies.[1] Elevating the deutsche mark as the dominant circulating currency to legal tender was one option, but it failed to gain traction, partly for fiscal reasons, partly because a national currency was believed to be more conducive to creating a national identity.[2]

A currency board introducing a national currency backed by the DM emerged as an attractive alternative (Coats 1999). A board could be set up more speedily than a central bank, and, as a rule-based regime, was expected to provide better insulation from political volatility in an

environment characterized by initial distrust among the three ethnic groups.[3] Reflecting these considerations, a highly orthodox currency board was introduced as part of the Dayton agreement, thus gaining external credibility support. The board was to remain in place for a transitional period of six years, after which the Parliamentary Assembly would have the option to retain or change the arrangement. In the event, the assembly chose to continue the arrangement with the objective of eventually following Estonia, Lithuania, and Bulgaria into the EU and from there into the Eurozone.

13.2 Structure

Following its establishment in August 1997, the Central Bank of Bosnia and Herzegovina (CBBH) began issuing konvertibilna marka (KM) in June 1998 under a deliberately restrictive currency board arrangement aiming to avoid political dissent.[4] Under the CBBH law, the konvertibilna marka was fixed at a 1:1 parity to the deutsche mark with both currencies circulating simultaneously.[5] On January 1, 1999, the peg was smoothly shifted to the euro using the DM conversion factor (1.95583 KM per euro).

The board maintains full foreign exchange backing for the domestic currency liabilities of the CBBH. The backing is defined in terms of net assets and liabilities. In contrast to most modern CBAs, the CBBH thus cannot increase note issue by borrowing foreign exchange. The CBBH law strictly prohibits the extension of credit to the government of Bosnia and Herzegovina, other government entities, and banks. Apart from excess reserves, the CBBH thus has minimal discretion; the monetary system is effectively rule based and comes very close to an orthodox currency board arrangement. The choice was deliberate, reflecting the desire to preempt potential sources of conflict. Indeed, as Coats (1999) recounts, in several areas the authorities rejected proposals by the IMF to retain some flexibility, including the option of liquidity management through CBBH-issued bills and the use of gross rather than net reserves.[6]

Reflecting the unsettled political situation, the legal structure of the CBBH goes to special lengths to enhance trust in its political independence. Article 3 of the CBBH leaves little room for ambiguity: "Within the limits of the authority established by this Law, the Central Bank shall be entirely independent from the Federation of Bosnia and Herze-

govina, the Republika Srpska, any public agency and any other authority in the pursuit of its objective and the performance of its tasks. Except as otherwise specified by law, the Central Bank shall take no instruction from any other person. The independence of the Central Bank shall be respected and no person shall seek improperly to influence any member of a decision making body of the Central Bank in the discharge of his duties towards the Central bank or interfere in the activities of the Central Bank."

The domestic tensions led to a final unusual decision: to avoid any controversy arising from choosing a governor from one of the three main ethnic groups, the Dayton agreement stipulated that the board would be led by a foreign expert appointed and paid by the International Monetary Fund (after consultation with the Presidency of Bosnia and Herzegovina) for an initial six-year period.[7] In addition to the governor, the initial board included one member from each of the three dominant groups, appointed for six-year terms.

Following the end of the six-year transitional arrangement in August 2003, the Parliamentary Assembly opted to retain the currency board regime with a long-term goal of EU and Eurozone membership. As stipulated in the CBBH law, the board of directors has been enlarged to comprise five citizens appointed by the Presidency, and has elected one of its members as governor. In order to smooth the transition, the choice fell on the previous governor, Peter Nicholl, who assumed Bosnian citizenship to qualify. On January 1, 2005, Vice President Kemal Kozarić assumed the governorship, completing the transition to domestic authority.

13.3 Monetary and Banking Policies

Following years of civil war, the financial system at the time of the Dayton agreement was weak; and regionally fragmented estimates suggested that as many as 90 percent of loans were nonperforming (International Monetary Fund 2005e, 10). No bank operated in the entire territory, noncash transfers were arranged through three regional payment bureaus unable to electronically clear balances among themselves. The banking system has since consolidated and grown substantially. Bank privatizations during 1998–2002 transferred most banks to foreign ownership. Coupled with increases in reserve requirements and other prudential measures, as well as a reform of the

payments system and the introduction of a limited deposit insurance scheme, banking system soundness (Ljubiša 2003) and credit availability to the private sector has improved.[8] A recent IMF assessment of the banking system is guardedly positive (International Monetary Fund 2005e).

13.4 Performance

Bosnia and Herzegovina has maintained a stable exchange rate with full convertibility[9] in the almost ten years since adoption of the currency board. Inflation remains under control, although stronger growth and a VAT increase have recently put some upward pressure on prices. The success in reducing inflation has contributed to a significant remonetization of the economy, as well as increased use of the KM and reduced reliance on the euro. Broad money growth has significantly exceeded inflation since 1999, with a step increase during the introduction of the euro suggesting that a significant fraction of the circulating DM notes were converted into KM rather than into euros. Yet there are also indications of less-than-perfect credibility, including continued currency substitution in deposits, the insistence on the use of indexation for longer-term contracts in local currency, and substantial (though declining) interest rate spreads relative to the euro (International Monetary Fund 2005e).

Economic and export growth has been consistently strong. Since Dayton, measured GDP has tripled, albeit from an extremely low starting point,[10] and unemployment remains well above 20 percent. Export growth has been sturdy, partly reflecting the broader regional recovery. Total exports have increased tenfold since Dayton, albeit again starting from a very depressed level (International Monetary Fund 2004b). The real effective exchange rate depreciated until 2002 and has been largely stable since, reflecting low inflation and offsetting trends relative to neighboring trade partners (notably Croatia, Montenegro, and Serbia). Fast export growth notwithstanding, Bosnia and Herzegovina continues to run very large external deficits, to a large extent reflecting imports supporting reconstruction. In recent years, the current account deficit was around 20 percent of GDP, reflecting an investment ratio of close to 20 percent of GDP coupled with negligible national savings (International Monetary Fund 2005e). The deficit has been largely financed by aid flows (now declining) and remittances.

The numerous temporary factors buffeting the external balance renders an assessment of a long-term competitive situation all but impossible.

13.5 Outlook

Following the expiration of the UN High Representative's term at the end of 2005, the EU-led successor body has taken a less active role with the aim of transferring authority to the entities, including the responsibility for policy coordination, notably the establishment of an integrated fiscal framework. Assuming the related transition challenges can be resolved, Bosnia and Herzegovina faces two significant economic risks over the medium term.

On the fiscal side, government spending remains at about 50 percent of GDP (International Monetary Fund 2005e). Moreover, the government is exposed to significant claims by citizens for war damages, seized bank deposits during the war, and other items, in the aggregate exceeding total GDP. A 2004 law restructured these claims into a combination of cash payments and long-term KM zero coupon bonds. The law faces legal challenges, and the final present discounted value of claims may consequently change, with a corresponding impact on the sustainability of the public finances.

Beyond the fiscal risk, the external imbalance remains a challenge. Declining external aid requires a greater reliance on domestic sources of financing, remittances, and foreign direct investment or necessitates external adjustment. As reconstruction and thus a sustained recovery of exports relies on imports, a sharp decline in imports would likely trigger adverse growth effects. While the issue does not appear critical at this time (International Monetary Fund 2005e, 6), a failure to resolve the financing issue could well put political pressure on the CBA over the next few years.[11]

The currency board in Bosnia and Herzegovina is the most orthodox among the modern boards. The board has gained substantial credibility and, notwithstanding discussions about moderately enhancing flexibility and introducing some scope for limited discretionary policy, the political consensus in favor of retaining the board is strong. Nonetheless, the system faces challenges. As in Argentina, the threat does not come from the board itself, but rather originates in doubts about the authorities' willingness and ability to tackle the necessary adjustment on the fiscal side and manage a smooth correction of the external

imbalances. If both can be achieved, the CBA may survive to fulfill its former governor's goal: "The exit strategy for BH from the currency board will . . . be the eventual adoption of the euro as the currency of BH" (Nicholl 2003, 4).[12]

Appendix

Table 13A.1 provides selected macroeconomic indicators covering the adoption and early years of Bosnia and Herzegovina's currency board.

Table 13A.1
Bosnia and Herzegovina: Selected macroeconomic indicators, 1995–2005

	1995	1996	1997[a]	1998	1999	2000	2001	2002	2003	2004	2005
Real GDP growth (in percent per year)	16.0	62.6	29.9	17.6	9.5	5.4	4.3	5.3	4.4	6.2	5.0
Real GDP per capita growth (in percent per year)	15.5	99.8	26.1	20.9	7.4	3.8	3.8	4.5	3.6	5.4	4.2
Unemployment rate	70.0	50.0	40.9	38.4	37.9	39.0	40.2	41.0	42.1	42.9	42.0
Inflation (average of period)	12.9	−11.5	5.6	−0.4	3.0	5.1	3.2	0.3	0.6	0.3	1.9
Inflation (end-of-period)	—	—	—	—	—	—	—	—	—	—	—
Broad money (growth, in percent per year)	—	—	—	29.7	39.4	14.0	88.5	7.0	9.9	24.3	18.2
Broad money (in percent of GDP)	—	—	17.5	19.4	23.7	24.2	41.9	42.4	44.0	50.6	55.7
Reserve money (growth, in percent per year)	—	—	—	38.8	241.7	19.2	164.6	−8.9	12.5	24.2	22.6
Reserve money (in percent of GDP)	—	—	2.5	2.9	8.8	9.4	22.8	19.6	20.9	24.0	27.4
Net foreign assets (in percent of reserve money)[b]	—	—	41.7	69.3	86.5	85.6	96.7	96.2	99.7	102.8	103.8
Credit to private sector (growth, in percent per year)	—	—	—	14.6	−2.3	11.1	13.7	36.2	24.8	27.5	—
Nonperforming loans (in percent of banking sector assets)[c]	—	—	—	—	—	13.1	18.8	8.1	5.0	3.1	—
Foreign currency deposits (in percent of broad money)	—	—	—	79.4	48.1	40.0	39.3	35.3	34.9	37.9	—
Deposit rate (percent per annum)	—	—	—	51.9	9.1	14.7	—	4.5	4.0	3.7	3.6
General government balance (in percent of GDP)	−3.3	−3.9	−0.4	−3.6	−6.4	−9.1	−4.9	−3.5	−2.4	−0.6	0.9

Table 13A.1
(continued)

	1995	1996	1997[a]	1998	1999	2000	2001	2002	2003	2004	2005
Central government balance (in percent of GDP)	—	−3.7	0.9	0.7	−1.4	−2.5	−1.0	−0.8	0.6	0.3	1.9
Exports of goods and services (in percent of GDP)	—	—	—	28.2	26.0	25.4	25.7	23.9	25.2	26.8	30.1
Exports of goods and services (real growth, in percent per year)	—	—	—	—	4.0	−2.5	5.9	−2.0	40.7	20.8	13.3
Imports of goods and services (in percent of GDP)	—	—	—	64.4	56.0	60.9	61.7	65.1	60.9	63.6	68.7
Imports of goods and services (real growth, in percent per year)	—	—	—	—	−4.3	9.6	10.3	11.5	37.8	3.4	4.9
Current account balance (in percent of GDP)	—	—	—	−8.4	−9.1	−17.5	−20.0	−26.5	−22.4	−24.4	−26.6
Direct investment, net (in percent of GDP)	—	—	—	2.2	1.8	3.0	2.3	4.7	5.3	7.1	7.1
Reserves at year-end (in percent of GDP)	—	—	2.0	3.8	9.1	10.3	23.9	23.2	24.8	28.5	29.1
External debt, total (in percent of GDP)	—	—	—	84.7	76.6	56.9	55.2	63.8	62.5	59.4	60.6

Sources: International Monetary Fund; WEO, IFS databases; and authors' estimates.
[a] The currency board began operation on August 1997.
[b] Defined as gross foreign assets minus liabilities, may differ from definition of reserves used for currency board coverage purposes.
[c] Arithmetic average of nonperforming loans in Republica Serbska and Federation of Bosnia and Herzegovina.

14 Euro-Based Currency Boards: An Assessment

In the preceding chapters we examined the individual euro currency boards, documenting their strong inflation and growth performance. It is of course possible that outside factors common to all the transition economies of central Europe deserve most of the credit, with the boards playing only a minor role. In the first part of this chapter, we explore this possibility by placing the experience of the euro boards in the context of the overall performance of the central European transition economies. The case studies also highlight the common exit strategy of the euro boards: all four countries wish to exit into the Eurozone; we examine the implications in the concluding section of this chapter.

14.1 The Euro Board Experience in the Transition Context

The dismantling of the Berlin wall in 1989, followed by the collapse of the Soviet Union in 1991, initiated a period of intense economic turmoil in the central and eastern European transition economies. A large body of literature explores their subsequent economic performance, highlighting both common factors, such as the large adverse terms of trade shocks for net energy importers, and the idiosyncratic elements, including the choice of exchange rate system. For the purpose of our inquiry, the intriguing, if hard-to-answer, question is what role the CBAs played relative to other factors—shared or idiosyncratic.

14.1.1 Inflation and Growth

As the preceding chapters have demonstrated, there can be little argument that the euro boards have delivered on their primary objective of maintaining low inflation since their introduction—accompanied by remonetization and financial deepening, the latter importantly shaped

Table 14.1
Real GDP per capita convergence, 1997–2005

	GDP per capita percent of EU-15, PPS, 1997	GDP per capita percent of EU-15, PPS, 2005	Change	Potential growth, 2001–2005	Of which TFP
Estonia	35.0	51.7	+16.7	6.9	3.3
Lithuania	33.3	47.1	+13.8	6.1	3.2
Latvia	29.8	43.1	+13.3	7.3	3.3
Hungary	45.5	57.2	+11.7	3.8	1.4
Slovenia	64.5	75.0	+10.5	3.7	1.4
Slovakia	42.3	50.1	+7.8	4.7	2.6
EU-10	44.3	52.1	+7.8	3.5	2.1
Poland	40.1	46.0	+5.9	3.0	2.3
Czech Republic	61.9	67.8	+5.9	2.9	1.9

Source: European Commission 2006, 43, 46.

by foreign-owned banks. The decline in inflation was accompanied by strong economic growth exceeding the growth rates in other transition economies (table 14.1). Average output growth rates in Estonia and Lithuania since 1995 have exceeded 5 percent per year. Over the same period average growth in Bosnia and Herzegovina has come in at above 15 percent per year, while Bulgaria after a more lackluster 1999 has enjoyed an average growth rate close to 5 percent per year.

As table 14.2 reveals, the higher average growth rate went hand in hand with a higher standard deviation of growth rates. Adjusting for the scale effect, Estonia places in the middle group in terms of the coefficient of variation, while Lithuania's growth rate remains among the most volatile.

Can the good performance in the CBA countries be causally attributed to the choice of a currency board? For sure, the good growth performance after the adoption of the CBA in war-torn Bosnia and Herzegovina and in post-hyperinflation Bulgaria reflects a rebound from extremely depressed activity levels that would at least to some extent also have taken place under any other exchange rate regime providing a modicum of stability. The intriguing question is whether the CBA provided an additional benefit.

To explore this possibility, the two panels of figure 14.1 plot the average GDP growth of the transition economies against their average in-

Table 14.2
Volatility, 1997–2005

	Standard deviation of growth, 1997–2005	Average growth, 1997–2005	CoV, 1997–2005
Hungary	0.5	4.3	0.116
Slovenia	0.9	3.9	0.231
Latvia	2.0	7.1	0.282
Slovakia	1.4	4.1	0.341
Estonia	2.9	6.8	0.426
Poland	1.8	3.9	0.462
EU-10	1.9	3.9	0.487
Lithuania	3.2	6.1	0.525
Czech Republic	2.2	2.3	0.957

Source: European Commission 2006, 43.

flation rate. We use two starting points: 1995, a time when the first turmoil caused by the transition was subsiding, and 2000, a time when accession to the EU became an immediate possibility. The plot is striking. Lithuania, Estonia, and Bosnia and Herzegovina enjoyed, respectively, the second to fourth fastest growth rates after Latvia since 2000. At the same time, Lithuania and Bosnia and Herzegovina experienced the lowest and second lowest inflation rates respectively, with Estonia ranking in the middle group. While the figure does not establish a causal link between the adoption of a CBA and subsequent inflation and growth performance, it provides evidence against the view that the good performance of the CBA economies was common to all transition economies; moreover, it provides another confirmation that the good inflation performance did not come at the cost of lower growth.

14.1.2 Fiscal Policy

The good inflation performance has been buttressed by prudent fiscal policies (table 14.3). Among the eight transition economies entering the EU in 2004, Estonia has recorded the smallest deficit every year since 2000, while Lithuania has consistently placed in the top half. In terms of public debt, the two currency board countries likewise place at the top, bracketing Latvia, and remain well below the Maastricht threshold.

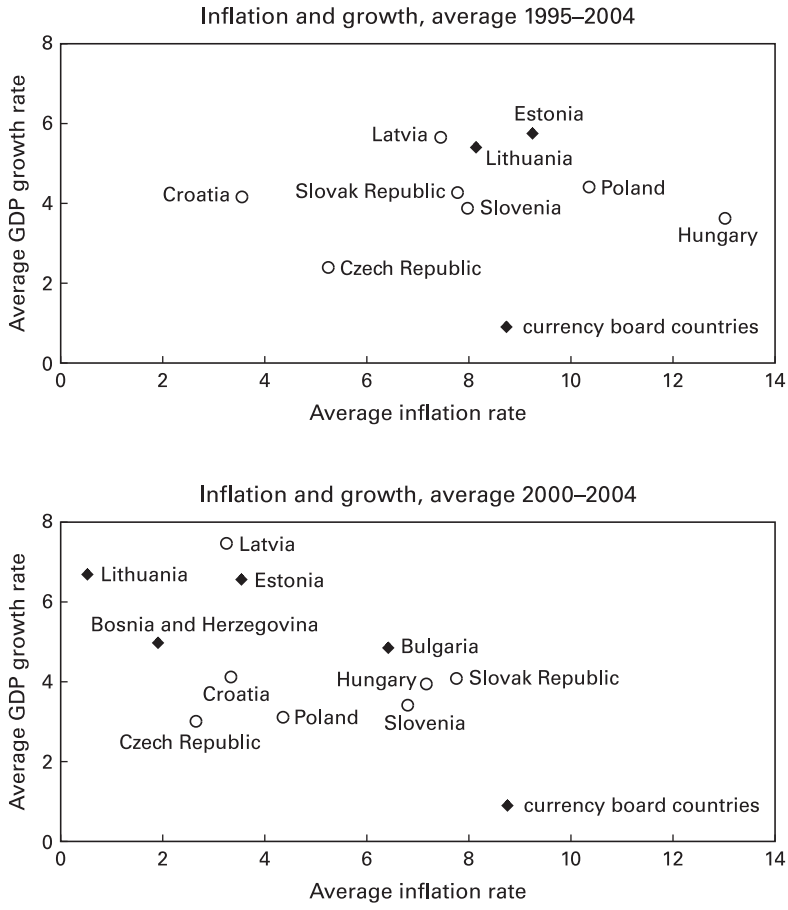


Figure 14.1
Inflation and growth in selected central and eastern European countries (in percent per year)
Source: International Monetary Fund; WEO database; authors' calculations.

14.1.3 External Performance and Competitiveness

Over the years, observers have repeatedly voiced concerns that—notwithstanding the relatively strong disinflation performance of Estonia and Lithuania—the remaining inflation differentials relative to Germany (in the case of Estonia) or the United States coupled with an appreciation of the dollar/euro exchange rate (in the case of Lithuania until its repegging) risked impairing competitiveness. In turn, this might erode popular support for currency boards, potentially trigger-

Table 14.3
Net lending (+)/borrowing (−) by the general government

	2000	2001	2002	2003	2004	2005E	2006E	Debt 2006E	Fiscal policy quality rank
Czech Republic	−3.7	−5.9	−6.8	−12.6	−4.8	−4.7	−4.3	40.6	8
Hungary	−3.0	−4.4	−9.2	−6.2	−5.5	−5.2	−4.7	58.9	7
Latvia	−2.8	−2.1	−2.7	−1.5	−2.0	−2.8	−2.9	16.6	3
Poland	−0.7	−3.8	−3.6	−3.9	−5.6	−4.1	−3.1	49.3	6
Slovenia	−3.5	−2.8	−2.4	−2.0	−2.3	−2.2	−1.9	30.6	5
Slovakia	−12.3	−6.0	−5.7	−3.7	−3.9	−4.0	−4.1	45.9	2
Estonia	−0.6	0.3	1.4	3.1	0.5	0.2	0.1	4.2	1
Lithuania	−2.5	−2.0	−1.5	−1.9	−2.6	−2.5	−1.9	21.3	4
Rank Estonia	1	1	1	1	1	1	1	1	
Rank Lithuania	3	2	2	3	4	3	2	3	

Sources: European Commission, reported in Schneider and Zápal 2005. New EU-10 comprises the ten member states joining in May 2004 (listed countries plus Cyprus and Malta); EU-15 includes member states prior to May 2004. Debt refers to general government consolidated gross debt as percentage of GDP at market prices. Fiscal policy quality rank, based on Zápal and Schneider 2006, 21, comprises reform efforts, aging impact, fiscal functions, and past behavior.

ing a switch to a more flexible regime like those increasingly adopted in the other central and east European countries (CEEC) during the 1990s (Corker et al. 2000).

CPI-based real exchange rates have indeed appreciated markedly in the early 1990s, though the increase has slowed down substantially since the late 1990s and unit labor cost-based measures have grown substantially less (though more so recently).[1] The degree to which the CPI reflects the "benign inflation" (Padoa-Schioppa 2003) of Balassa-Samuelson effects on nontraded prices remains debated.[2] While there is quite strong evidence of traded sector productivity growth raising nontraded prices, the small size of the nontraded sector places a limit on the extent to which Balassa-Samuelson effects can account for the increase of the overall price level.

In any event, the appreciation of the CPI-based real exchange rate has not resulted in evident competitiveness problems, even as Estonia and Lithuania are well into their second decade of operating under a currency board. Looking forward, two rival interpretations can be put

Table 14.4
Competitiveness rankings within the group of transition economies

2001	2001–2002	2007–2008	Change
Estonia	2	1	Gained 1
Czech Republic	4	2	Gained 2
Lithuania	7	3	Gained 4
Slovenia	3	4	Lost 1
Slovak Republic	5	5	No change
Latvia	8	6	Gained 2
Hungary	1	7	Lost 6
Poland	6	8	Lost 2
Croatia	—	9	—
Ukraine	11	10	Gained 1
Romania	9	11	Lost 2
Bulgaria	10	12	Lost 2
Montenegro	—	13	—
Serbia	—	14	—
FYR Macedonia	—	15	—
Moldova	—	16	—
Bosnia and Herzegovina	—	17	—
Albania	—	18	—

Sources: Own calculations based on World Economic Forum data.
2001–2002: http://www.weforum.org/pdf/Gcr/GCR_01_02_Executive_Summary.pdf (accessed November 7, 2007).
2007–2008: http://www.weforum.org/pdf/Global_Competitiveness_Reports/Reports/gcr_2007/gcr2007_rankings.pdf (accessed November 7, 2007).

forward. Under one view, highly undervalued initial real exchange rates have postponed but not canceled the judgment day. Under a more benign view, labor market flexibility will allow the CBA countries to maintain their competitive position.

Contrasting actual with estimated equilibrium exchange rates provides one way of exploring the merits of these two views, subject to the methodological difficulties of determining equilibrium exchange rates.[3] An alternative answer is provided in table 14.4, reporting the within-group rankings of the leading transition economies based on the 2001/02 and the 2007/08 Global Competitiveness Report published by the World Economic Forum. The table reveals relatively muted changes over the six-year period, except for a decline in Hungary's relative position. Among the currency board economies, Estonia ranks second in 2001/02 and first in 2007/08; Lithuania improves from

the seventh to the third rank, and Bugaria declines from the tenth to the twelfth rank. Bosnia and Herzegovina was not rated in 2001/02 and places next to last in the group in 2007/08. While the rankings of course depend on the specific methodology used and must thus be taken with a grain of salt, the overall picture does not support the notion of declining competitiveness in the CBAs relative to transition economies with more flexible exchange rate regimes. Rather, much as was the case with growth, the CBAs seem if anything to outperform comparable accession countries operating under more flexible regimes, though again no causality can be inferred.

14.2 Exit

It is impossible to maintain high economic growth, keep inflation under control, and at the same time have a fixed exchange rate within the ERM-2 limit.

—Mirek Topolanek, Prime Minister, Czech Republic, September 2006

All four European countries operating CBAs have expressed a desire to exit directly from the currency board to Eurozone membership. All three current EU member states with a CBA, Bulgaria, Estonia, and Lithuania, are required by treaty to strive for the eventual adoption of the euro, though in principle they retain the option to first exit to a non-CBA system. The one CBA economy not currently a member of the EU, Bosnia and Herzegovina, has also expressed a desire to retain the CBA until and beyond entry into the EU with an eventual direct exit to the Eurozone.

Eurozone membership depends on the fulfillment of the convergence criteria (box 14.1) including two years of exchange rate stability under ERM-II, convergence of legal structures, as well as passing fiscal, inflation, and interest rate convergence criteria (tables 14.5 and 14.6). In practice, the membership date thus depends upon both the willingness and the readiness of the member state to apply. Upon submitting an application, the ECB and the EU Commission provide an assessment of the convergence process; if the criteria are satisfied, new member states can be admitted to the Eurozone by a Council decision.

Countries not currently in the Eurozone face multiple choices regarding exchange rate policies, in particular when and under what regime to enter ERM-II and, for countries on fixed exchange rates, whether to retain the parity or opt for a one-time devaluation prior to entering ERM-II. For the central European countries entering the EU in

Box 14.1
The convergence process under ERMII

Under Article 122 (2) of the treaty establishing the European Community, the European Commission and the European Central Bank report bi-annually to the Council of Ministers on whether EU member states that (a) have not joined the European Monetary Union and (b) have no opt out right (Denmark and the United Kingdom) have achieved a high degree of sustainable convergence and comply with the statutory requirements for national central banks to function within the euro system. At present, twelve member states fall into this group: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Sweden.

The criteria used to assess sustainable convergence are as follows:

- "The achievement of a high degree of price stability," defined as an average rate of HICP inflation over the preceding year that does not exceed by more than 1.5 percentage points that of the three best performing EU member states in terms of inflation. For the latest (2006) assessment, the three best performing member states were Sweden (0.9 percent), Finland (1.0 percent), and Poland (1.5 percent), yielding an average of 1.1 percent and thus a reference value of 2.6 percent, up from 2.4 percent at the time of the last assessment in 2004.
- "The sustainability of the government financial position," interpreted to mean that "at the time of the examination the member state is not the subject of a Council decision under Article 104 (6)." Such a decision in turn is based on a report prepared by the Commission if a member state does not fulfill the requirements for fiscal discipline, in particular if the actual or planned deficit exceeds a reference value (3 percent of GDP) (unless an excess is diminishing rapidly, or is exceptional) or if the ratio of debt to GDP exceeds a reference value (60 percent) (unless it is diminishing toward the 60 percent mark).
- "The observance of the normal fluctuation margins provided for by the exchange rate mechanism of the European Monetary System, for at least two years, without devaluing against the currency of any other member state."
- "The durability of convergence achieved by the Member State and of its participation in the exchange rate mechanism of the European Monetary System being reflected in the long-term interest-rate levels," defined as an average long term interest rate over the preceding year that does not exceeded by more than two points the average of the long term rates in the three best performing member states with regard to the inflation criteria. For the latest (2006) assessment, the long term interest rates of the three lowest inflation member states were 3.3 percent (Sweden and Finland) and 5.0 percent (Poland), yielding an average of 3.9 percent and hence a reference value of 5.9 percent, down from 6.4 percent in 2004.

Box 14.1
(continued)

In addition, the ECB assesses the compatibility of EU member states' legislation, including national central bank (NCB) statutes, with Articles 108 and 109 of the Treaty and the European System of Central Banks (ESCB) statute. Important components include (a) compatibility with provisions on the independence. The focus is on (a) the objectives and independence of NCBs (art. 108), (b) prohibitions on monetary financing (Art. 102), and (c) the legal integration of the NCBs into the euro system.

Sources: European Central Bank 2004, 7–13; European Central Bank 2006, 14–22.

Table 14.5
Compliance with fiscal convergence criteria

	Deficit 1999	Deficit 2004	Deficit 2005	Deficit 2006	Debt 1999	Debt 2004	Debt 2005	Debt 2006
Threshold	3%	3%	3%	3%	60%	60%	60%	60%
Estonia	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lithuania	Yes	Yes	Yes	Yes[a]	Yes	Yes	Yes	Yes[a]
Czech Republic	No	Yes	No	No	Yes	Yes	Yes	Yes
Hungary	No	No	No	No	Yes	Yes	Yes	Yes
Latvia	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Poland	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Slovakia	No	Yes	No	No	Yes	Yes	Yes	Yes
Slovenia	Yes	Yes	Yes	Yes[a]	Yes	Yes	Yes	Yes[a]
# of countries satisfying criterion	3	6	5	5	8	8	7	7

Sources: European Commission 2004, 2006; European Central Bank 2006a, b.
[a] For Slovenia (which introduced the euro in 2007) and Lithuania (which still is an ERM-II member) in 2006, we report the information from the May 2006 convergence reports. Neither country was included in the December 2006 convergence reports, which we use for all other countries.

Table 14.6
Compliance with nominal convergence criteria

	Inflation			Long-term interest rate			2YR ERM-II membership completed in
	1997	2005	2006	2001	2005	2006	
Hypothetical threshold	2.7%	2.5%	2.8%	6.9%	6.4%	6.2%	24 months
Estonia	No	No	No	—	(Yes)	(Yes)	6/2006
Lithuania	No	No	No[a]	No	Yes	Yes[a]	6/2006
Czech Republic	No	Yes	Yes	Yes	Yes	Yes	Not in ERM-II
Hungary	No	No	No	No	No	No	Not in ERM-II
Latvia	No	No	No	No	Yes	Yes	4/2007
Poland	No	Yes	Yes	No	No	Yes	Not in ERM-II
Slovakia	No	No	No	No	Yes	Yes	11/2007
Slovenia	No	Yes	Yes[a]	—	Yes	Yes[a]	6/2006
# of countries satisfying criterion	0	3	3	1	6	7	

Sources: European Commission 2004, 2006; European Central Bank 2006a, b. Hypothetical inflation and interest rate criteria for 1997, 2001, and 2005 computed based on European Commission 2006, 49. Estonia does not have long-term debt instruments usable for the long-term interest rate criteria. The convergence reports, however, conclude that there are no reasons to suppose that Estonia would violate the criteria. Box 14.1 provides background on the criteria.

[a] For Slovenia (which introduced the euro in 2007) and Lithuania (which still is an ERM-II member) we report the information from the May 2006 convergence reports for 2006. Neither country was included in the December 2006 convergence reports, which we use for all other countries. The May 2006 thresholds were 2.6 percent for inflation and 5.9 percent for the interest rate.

May 2004, these choices have been explored in a very lively literature. The most popular school of thought argues for a period of exchange rate flexibility prior to ERM-II membership at least for the larger economies. Such flexibility, it is hoped, would allow the nominal exchange rate against the euro to find an equilibrium prior to Eurozone membership. A subsidiary argument emphasizes that flexibility may also assist countries previously operating under pegged rates to develop monetary policy and intervention capabilities in preparation for membership in the European System of Central Banks (ESCB).

While these arguments carry some weight for the larger accession countries, their application to the very small and open economies operating under CBAs is more debatable. After more than a decade of operating a hard peg in market environments generally thought to be

among the more flexible in the EU, enhanced exchange rate flexibility to address an overvaluation problem seems not a pressing concern, particularly since there is little evidence pointing to significant misalignment. While the lack of operational experience with floating rates is more pertinent, it is quite doubtful whether the experience gains outweigh the operational costs and the potential loss of credibility entailed in surrendering a well-established CBA.[4]

Accepting this point, contributions to the literature arguing in favor of flexibility for the larger economies often explicitly exempt Estonia and Lithuania as special cases due to their long experience with hard pegs.[5] In any case, the discussion appears moot at this juncture because all four CBA countries have consistently stated their intention to join the Eurozone directly from the CBA at an unchanged parity at the earliest time.[6] Having entered ERM-II in June 2004, both Estonia and Lithuania now satisfy the exchange rate stability criterion.[7] Both countries also fulfill the fiscal and interest rate criteria. However, an uptick in inflation has placed both countries above the convergence threshold for 2006. Estonia accordingly did not apply for January 2007 membership. Lithuania requested an assessment but saw its application for Eurozone membership rejected in a controversial decision based on a marginal violation of the inflation criterion. Slovenia, the only other accession country requesting a convergence assessment, passed the assessment and became the thirteenth member of the Eurozone at the beginning of 2007.

14.3 Conclusion

The euro currency boards have met their primary objective of achieving and sustaining low inflation. Furthermore, there is little evidence suggesting that the good inflation performance came at a high real cost. On the contrary, growth under currency boards has been among the highest in the accession countries; external crises have been weathered well, and despite substantial real exchange rate appreciation, several of the transition/accession economies with currency boards have moved up in competitiveness rankings. To be sure, the combination of below-average inflation and above-average growth cannot be attributed solely to currency boards. Yet it strongly suggests that CBAs, properly supported by adequate macroeconomic and structural frameworks, were the right choice for the small, very open European economies.

15 Conclusions

The relationship between commitment and doubt is by no means an antagonistic one. Commitment is healthiest when it is not without doubt but in spite of doubt.

—Rollo May, *The Courage to Create*

In the first half of the twentieth century, currency boards were both popular—with more than fifty boards in existence at the peak—and by and large successful, especially in relation to the repeated monetary crises elsewhere. For a combination of economic and political factors, currency boards became all but extinct by the 1970s. Argentina's 1991 readoption of a currency board as part of a last-ditch stabilization effort thrust boards back into the limelight. Over the subsequent decade, a number of other countries adopted boards, and many more considered their adoption.

Yet currency boards remain controversial. A lively debate pits proponents who advocate boards as a remedy for various monetary ailments against skeptics who view boards as little more than a passing fad, imposing far too tight a straightjacket except possibly for countries in the midst of monetary mayhem.

The dramatic collapse of Argentina's regime in 2002 was widely interpreted as a vindication of the skeptical view. Partly as a consequence, the fashion in exchange rate regimes has shifted back to more flexible arrangements. The dominance of Argentina in the currency board debate has deflected attention from the continued successful operation of the euro boards (and others). The striking fact that there have been fewer than five forced exits from currency boards over the last 150 years has been all but forgotten.

In writing this book, we have tried to provide a comprehensive, balanced look at currency board regimes, complementing cross-regime

econometric analysis with more detailed case studies. The cross-regime evidence is strikingly favorable for currency boards. Compared to countries with either softer pegs or floating regimes, countries operating under currency boards achieved markedly lower inflation rates. Perhaps more surprisingly, the better inflation performance has not come at the cost of underperformance in growth or trade. Indeed, the evidence suggests that output growth has, if anything, been higher under currency boards, though the positive differential is not statistically robust. The positive association of course does not establish causation. Indeed, as most modern currency boards were introduced against the backdrop of high inflation or civil unrest, an initial rebound effect is to be expected under virtually any stabilization program. Yet we find that the performance bonus persists beyond this initial spurt. The recent performance of the two EU accession countries with currency boards provides a graphic illustration. Estonia and Lithuania, both in the second decade of their currency boards, continue to place at the top of the growth ranking among all transition economies. Even if one were to discount any positive effect of the regime on growth, at a minimum the data do not support the argument that the adoption of a currency board is necessarily associated with slower growth.

The good output performance is matched by strong export growth; we find no evidence of an adverse effect on competitiveness. Nor have the restrictions on the central bank's lender of last resort function resulted in any greater susceptibility to financial crises, which are actually rarer under currency boards than under other regimes. The only systematic effect appears to be somewhat higher output volatility, consistent with the familiar Mundell-Fleming reasoning.

The evidence thus speaks quite clearly: countries operating under currency boards have enjoyed lower inflation, with no evidence of countervailing real costs save a somewhat higher volatility and indeed some suggestion of a growth bonus. Of course the good performance might simply reflect underlying preferences, the pursuit of other policies facilitating the adoption and successful operation of currency boards, or exogenous factors. After all, the small sample of modern boards is hardly random, and the decision to adopt a currency board—often embedded in law—may reflect a broad societal consensus. Roubini (1999) argues along these lines that "these countries are successful not because of the CB system itself but rather because they follow macroeconomic policies and structural liberalization policies that are consistent with the maintenance of fixed rates" (1).

Endogenous regime choice and reverse causation are valid concerns in interpreting the empirical findings, though our case studies suggest that broad-based popular support for the introduction of a board was the exception rather than the rule. For our empirical work, we address these concerns using two approaches, by estimating a simultaneous equation framework allowing for endogenous regime choice and by restricting the sample to low-inflation countries that clearly could have adopted (and maintained) currency boards had they chosen to, but did not. Both explorations yield the same result: while simultaneity matters, it cannot account for the performance differential in favor of currency boards. Put differently, currency boards bring additional credibility and discipline to the table even for the subset of countries with (revealed) low-inflation preferences. The finding suggests that the endogeneity argument operates in both directions. Just as a preexisting preference for low inflation and stable fiscal policies may favor the adoption of a currency board, so the adoption of a currency board may strengthen political resolve for fiscal consolidation and structural reforms.

Argentina, undoubtedly both the most celebrated and most criticized currency board experience, shows the limits of these arguments. A careful look at the evidence acquits the currency board of being the direct cause of and major culprit behind the 2002 crisis, either by letting the exchange rate become overvalued and undermining export competitiveness or by forcing a tighter monetary stance than a more flexible regime would have allowed. Rather, the failure of Argentina lay in the lack of political will to tackle structural reforms of the economy and, above all, to maintain fiscal discipline. If the currency board is complicit in the subsequent debt crisis, it was by giving a false sense of assurance to external creditors and domestic borrowers that allowed an unsustainable buildup of debt.

On balance, while currency boards are clearly no panacea, looking across the various modern currency boards, one finds that their track record is impressive. This does not imply an unconditional endorsement. Currency boards, like any other exchange rate regime, are a means to an end, not an end in itself; whether they are the right tool depends on the job at hand.

For the central European countries struggling with macroeconomic stabilization and the transition from centrally planned to market economies, the evidence strongly suggests that currency boards were the right tool. The precise circumstances and reasons for adopting the

currency board differed across these four countries—in Estonia, it was stabilization following initial price liberalization in a country that lacked a policy track record; in Lithuania, rapidly eroding credibility following failed stabilization efforts; in Bulgaria, hyperinflation; and in Bosnia and Herzegovina, ethnic tensions and deep distrust about who would control economic policies and the public finances. Across these different circumstances, the experience has been broadly positive, with low inflation, strong growth, and rapid progress in economic transformation. Moreover, the euro boards have one major advantage, not fully appreciated at the time of their inception and unavailable to other currency board countries: a clear exit strategy allowing them to eventually transition from a regime that has served them well into another hard peg, membership in the Eurozone.

As for currency boards, they will remain in the exchange rate regime toolbox as an attractive option—for small open economies looking for credibility or aiming to support trade with a large partner—to be pulled out as and when necessary. To paraphrase Mark Twain, reports of their imminent demise post-Argentina are likely to be exaggerated.

Appendix 1: Institutional Characteristics of Modern Currency Boards

As stressed throughout the book, the details of currency boards matter. The credibility of a board, and its ability to counteract shocks or allow LOLR operations, depend, inter alia, on the institutional constraints under which it operates. Tables A1.1–A1.6 provide detailed information on the institutional characteristics of modern currency boards. The overarching themes emerging from the tables are discussed in section 4.4. Ho (2002) and Camilleri Gilson (2004) provide excellent overviews of currency board arrangements.

Table A1.1
Principle characteristics of modern currency boards

Country	Start (end)	Initial/ current anchor	Backing rule	Actual backing end, 2000 (% of M0)	Actual backing end, 2004 (% of M0)
Antigua and Barbuda	1965	£/US$	60%+ of currency and bank reserves	82.4	93.9
Dominica	1965	£/US$	Same	85.9	97.6
Grenada	1965	£/US$	Same	95.1	100.2
St. Kitts and Nevis	1965	£/US$	Same	87.4	100.0
St. Lucia	1965	£/US$	Same	100.6	105.9
St. Vincent and the Grenadines	1965	£/US$	Same	95.0	119.2
Brunei Darussalam	1967	Singapore dollar	70%+ of demand liabilities, 30% in liquid assets	n.a.	n.a.
Cayman Islands	1972	US$		n.a.	n.a.
Djibouti	1949	FF US$	100% of currency	121.3	117.6
Swaziland	1974–1986	Rand	100%	901.2	n.a.
Argentina	1991–2001	US$	100% of monetary base	178.6	96.6
Bosnia and Herzegovina	1997	DM/euro	100% of central bank monetary liabilities	108.6	107.6
Bulgaria	1997	DM/euro	100% of central bank liabilities	223.5	172.9
Estonia	1992	DM/euro	100% of M_0 excluding central bank certificates	117.7	123.7
Hong Kong (SAR)	1983	US$	100% of "certificates of indebtedness"[a]	373.1	306.9
Lithuania	1994	US$/euro	100% of currency and CB liquid liabilities	136.0	128.9

Sources: Baliño and Enoch 1997; Tsang 1999; Ho 2001; and country sources. Bosnia and Herzegovina, Bulgaria, Estonia, and Lithuania have changed the anchor currency to the euro.

[a] Issued to note issuing banks as backup for currency.

Table A1.2
Backing rules: Allowable assets and covered liabilities

Country	Assets				Liabilities						
	Forex	Gold	IMF assets	Other	Currency	Bank reserves	Other reserves	IMF liab.	Collateral paper	Repos	Other
Brunei Darussalam	—	—	—	Accrued interest	—	—	—	—	—	—	—
Cayman Islands	—	—	—	—	—	—	—	—	—	—	—
Djibouti	—	—	—	—	Y	—	—	—	—	—	—
ECCB	Y	Y	—	—	Y	Y	—	—	—	—	—
Argentina	Y	Y	N	Net position against other ALADI central banks	Y	Y	N	N	N	Y	—
Bosnia and Herzegovina	Y	N	Y	Other assets	Y	Y	Y	Y	N	N	Liab. to nonresidents
Bulgaria	Y	Y	N	Interest receivable	Y	Y	Y	N	N	N	Interest payable, banking department deposit
Estonia	Y	Y	Y		Y	Y	Y	Y	Y	N	Foreign debt, FX deposits, liab. to nonresidents
Hong Kong (SAR)	Y	N	N	Interest receivable	Y	Y	N	N	Y	N	Interest payable
Lithuania	Y	Y	Y	Outstanding claims, other assets	Y	Y	Y	Y	N	Y	Liabilities to nonresidents

Sources: Ho 2002 and IMF sources. For Argentina, foreign exchange includes a limited amount of US$ denominated Argentine public debt.

Table A1.3
Convertibility

Country	Parity (final/latest)	Is base money convert-ible?	Does central bank de jure have to issue at the official rate?	Can individuals directly convert?
Brunei Darussalam	1 Brunei $ = 1 Singapore $	Yes	—	Yes[a]
Djibouti	DF 177.121 = 1 US$	Yes	—	—
ECCB	EC $ 2.70 = 1US$	Yes	—	—
Argentina	1 peso = 1 US$	Yes	No	No, banks only
Bosnia and Herzegovina	KM 1.9958 = 1 euro	Yes	Yes	No, banks only
Bulgaria	Leva 1.9958 = 1 euro	Yes	Yes (with spread)	Yes
Estonia	EEK 15.6466 = 1 euro	Yes	No	No, banks only
Hong Kong (SAR)	7.8 HKD = 1 US$	Yes[b]	Cash yes	No, banks only
Lithuania	LTL 3.4528 = 1 euro	Yes	Yes	No, banks only

Sources: Ho 2002 and country sources.
[a] Through banks which, by central bank order, have to convert without charge.
[b] Except exchange fund bills and notes.

Table A1.4
The legal anchor

Country	Legal basis	Is convertibility guaranteed in law?	Is the backing rule specified in law?	Is the anchor currency specified in law?	Is the parity specified in law?	Is lending to the government prohibited?
Brunei Darussalam	—	—	—	—	—	—
Djibouti	—	—	—	—	—	—
ECCB	—	—		—	—	
Argentina	Currency board law, separate central bank law	Yes	Yes	Yes	Yes	Prohibited, but may buy securities at market prices
Bosnia and Herzegovina	Unitary central bank law, constitution	Yes	Yes	Yes	Yes	Prohibited
Bulgaria	Unitary central bank law	Yes	Yes	Yes	Yes	Prohibited
Estonia	Currency board law, separate central bank law	No, but guaranteed by Eesti Pank	Yes	Yes	No	Prohibited
Hong Kong (SAR)	No specific central bank law, basic law 111	No	No	No	No	—
Lithuania	Currency board law, separate central bank law	Yes	Yes	No	No	—

Sources: Tsang 1999; Ho 2002; Baliño and Enoch 1997, and country sources.

Table A1.5
Monetary and government banking functions

Country	Reserve requirements	Reserve ratio, base	Are reserves remuner-ated?	Other monetary instruments	Location of government deposits
Brunei Darussalam	—	—	—	—	—
Djibouti	—	—	—		—
ECCB	—	—	—		—
Argentina	Liquidity requirements	20% all deposits	Yes	Overnight repo, reverse repo, advances and rediscounts	—
Bosnia and Herzegovina	Yes	10–15% of konvertibilna marka liabilities	Yes	None	—
Bulgaria	Yes	8% all deposits	No	None	With the central bank
Estonia	Yes	10% + 3%	Yes	Standing deposit facilities	
Hong Kong (SAR)	No	None	None	Overnight repo, intraday repo	With commercial banks
Lithuania	Yes	8% deposits < 1Y	No	Overnight lending, fine-tuning facilities	With the central bank

Sources: Ghosh, Gulde, and Wolf 2000; Ho 2002; and country sources.

Table A1.6
Lender of last resort functions

Country	Institution	Conditions for LOLR	Conditions for access
Brunei Darussalam	—	—	—
Djibouti	—	—	—
ECCB	—	—	—
Argentina	Board of directors of central bank	Extraordinary circumstances	Collateral. For domestic banks controlling interest. Backing rule must be maintained.
Bosnia and Herzegovina	—	Not permitted	—
Bulgaria	Managing board/ banking department	Systemic risk	Collateral. Cannot exceed excess reserves. Three months' time limit.
Estonia	Central bank	No formal LOLR role	—
Hong Kong (SAR)	Monetary authority/financial secretary	Systemic risk	Collateral. Cannot exceed excess reserves.
Lithuania	Central bank	No formal LOLR role	—

Sources: Ho 2002; IMF sources.

Appendix 2: Data Sources and Definitions

Data on most macroeconomic variables used in this book are taken from the International Monetary Fund's World Economic Outlook database, an annual database covering virtually every IMF member country. A few series are taken from the International Financial Statistics database. Other variables used in our analysis include:

- The central bank turnover rate, which is the number of central bank governors per five-year period, based on a questionnaire sent to central banks, updating the database of Steven Webb (World Bank); see Cukierman, Webb, and Neyapti 1992.
- Average years of schooling of total population aged 25 years or older, taken from the Barro-Lee dataset.
- Indexes of current account and capital account restrictions, taken from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.
- Nominal and real effective exchange rate indexes, taken from the IMF's Information Notice System.
- Export concentration ratios, calculated from the IMF's Direction of Trade Statistics database.
- Currency and banking crises, taken from Glick and Hutchison 2001, augmented by Alexander et al. 1997.

A detailed listing of the data used in the book is provided in table A2.1.

Table A2.1
Data sources and definitions

Variable	Description	Source[a]	Units[b]
AVGYRSCH	Average number of years of schooling of total population age twenty-five and older	Barro-Lee	Years
BMG	Broad money growth	WEO	Percent per year (decimal fraction)
BMGX	Broad money growth, scaled, $m/(1+m)$, average of period	WEO	Percent per year (decimal fraction)
BNKDUR	Banking crisis duration	Glick and Hutchison 2001; authors	Dummy variable
BNKSTRT	Banking crisis start year	Glick and Hutchison 2001; authors	Dummy variable
CAGDP	Current account (percent of GDP)	WEO	Decimal fraction
CBTURN5	Central bank governor turnover rate (per 5 years)	Authors based on Cukierman 1992	Decimal fraction
CGGDP	Central government balance (percent of GDP)	WEO	Decimal fraction
CGGDPM3	Central government balance (percent of GDP), three-year backward average	WEO	Decimal fraction
CPIG	Consumer price index growth (average of period)	WEO	Percent per year (decimal fraction)
CPIGX	Consumer price inflation, scaled, $p/(1+p)$, average of period	WEO	Percent per year (decimal fraction)
CURCON	Current account restrictions	AREAR	Dummy variable
CURDUR	Currency crisis duration	Glick and Hutchison 2001	Dummy variable
CURSTRT	Currency crisis start year	Glick and Hutchison 2001	Dummy variable
DISA	Initial inflation below 20 percent per year, at least 5 percentage point decline over two years: $\pi_{t_0-2} - \pi_{t_0} > 0.05$	Authors	Dummy variable
DISB	Initial inflation below 50 percent and above 20 percent per year, at least 10 percentage point decline over two years: $\pi_{t_0-2} - \pi_{t_0} > 0.10$	Authors	Dummy variable

Table A2.1
(continued)

Variable	Description	Source[a]	Units[b]
DISC	Initial inflation above 50 percent per year, at least 20 percentage point decline over two years: $\pi_{t_0-2} - \pi_{t_0} > 0.20$	Authors	Dummy variable
DIST1	Squared distance weighted dollar GDP of other countries	Authors	U.S. dollars
DUR1DISA	DISA and inflation in $t_0 + 1$ below inflation in t_0	Authors	Dummy variable
DUR1DISB	DISB and inflation in $t_0 + 1$ below inflation in t_0	Authors	Dummy variable
DUR1DISC	DISC and inflation in $t_0 + 1$ below inflation in t_0	Authors	Dummy variable
DUR2DISA	DISA and inflation in $t_0 + 2$ below inflation in t_0	Authors	Dummy variable
DUR2DISB	DISB and inflation in $t_0 + 2$ below inflation in t_0	Authors	Dummy variable
DUR2DISC	DISC and inflation in $t_0 + 2$ below inflation in t_0	Authors	Dummy variable
DUR3DISA	DISA and inflation in $t_0 + 3$ below inflation in t_0	Authors	Dummy variable
DUR3DISB	DISB and inflation in $t_0 + 3$ below inflation in t_0	Authors	Dummy variable
DUR3DISC	DISC and inflation in $t_0 + 3$ below inflation in t_0	Authors	Dummy variable
EDNA	Nominal exchange rate	IFS	Dollar per national currency
ENDA	Nominal exchange rate	IFS	National currency per U.S. dollar
GAP	Ratio of per capita GDP to U.S. per capita GDP in 1970 (international prices)	WEO	Number
GAPHPREG	Ratio of per capita GDP to U.S. per capita GDP in 1970 (international prices)	Authors	Number
GAPREG	GAP as of time of adoption of exchange rate regime	Authors	Number
GDPG	Real GDP growth	WEO	Percent per year (decimal fraction)
GDPGS3	GDP growth, constant prices, three-year centered standard deviation	WEO	Percent per year (decimal fraction)
GDPPCG	Per capita real GDP growth	WEO	Percent per year (decimal fraction)

Table A2.1
(continued)

Variable	Description	Source[a]	Units[b]
GDPPCGS3	Per capita Real GDP growth, three-year centered standard deviation	WEO	Percent per year (decimal fraction)
HPDVS3	Three-year centered standard deviation of deviation of real GDP from Hodrick Prescott trend	Authors	Percent (decimal fraction)
IGDP	Gross fixed investment (percent of GDP)	WEO	Decimal fraction
IGDPM3	Gross fixed investment (percent of GDP), three-year backward average	WEO	Decimal fraction
IGDPS3	Gross fixed investment (percent of GDP), three-year centered standard deviation	WEO	Decimal fraction
IRATE	Nominal interest rate	IFS	Percent per year (decimal fraction)
KAPCON	Capital account restrictions	AREAR	Dummy variable
LIC	Lower-income countries (constant for sample)	World Bank	Dummy variable
LLMIC	Lower-middle-income countries (constant for sample)	World Bank	Dummy variable
LMIC	Lower-middle-income countries (constant for sample)	World Bank	Dummy variable
MG	Imports of goods and services, volume growth	WEO	Decimal fraction
MGDP	Imports of goods and services (percent of GDP)	WEO	Decimal fraction
MGM3	Imports of goods and services, volume growth, three-year backward average	WEO	Decimal fraction
NAM	International Finance Statistics (IFS) country code	IFS	Number
NCGDP	Private consumption expenditure (percent of GDP)	WEO	Decimal fraction
NCGDPS3	Private consumption expenditure (percent of GDP), three-year centered standard deviation	WEO	Decimal fraction

Table A2.1
(continued)

Variable	Description	Source[a]	Units[b]
NCP_R	Private consumption expenditure	WEO	Billions, national currency, constant prices
NCPRG	Private consumption expenditure growth, constant prices	WEO	Percent per year (decimal fraction)
NCPRGS3	Private consumption expenditure growth, constant prices, three-year centered standard deviation	WEO	Percent per year (decimal fraction)
NFI	Gross fixed capital formation	WEO	Billions, national currency
NGDP	Nominal GDP	WEO	Billions, national currency
NGDP_R	Real GDP	WEO	Billions, national currency, constant prices
NGDPD	Nominal GDP	WEO	Billions, U.S. dollars
PCPI	Consumer price index	Index	
POP	Population	WEO	Millions
POPG	Population growth	WEO	Decimal fraction
POPGM3	Population growth, three-year backward average	WEO	Percent per year (decimal fraction)
RDIST1	Distanced-weighted GDP of other countries	Authors	
RDIST2	Squared distanced-weighted GDP of other countries	Authors	
REERAOP	Real exchange rate, average-of-period	INS	Index
REGIME	Exchange rate regime		
RGDPDVS3	Deviation of Real GDP from HP-filtered trend, three-year standard deviation	WEO	Percent (decimal fraction)
SAVGGDP	Public saving (percent of GDP)	WEO	Decimal fraction
SAVPGDP	Private saving (percent of GDP)	WEO	Decimal fraction
SUR1DISA	DISA and inflation in $t_0 + 1$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR1DISB	DISB and inflation in $t_0 + 1$ below inflation in $t_0 - 2$	Authors	Dummy variable

Table A2.1
(continued)

Variable	Description	Source[a]	Units[b]
SUR1DISC	DISC and inflation in $t_0 + 1$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR2DISA	DISA and inflation in $t_0 + 2$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR2DISB	DISB and inflation in $t_0 + 2$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR2DISC	DISC and inflation in $t_0 + 2$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR3DISA	DISA and inflation in $t_0 + 3$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR3DISB	DISB and inflation in $t_0 + 3$ below inflation in $t_0 - 2$	Authors	Dummy variable
SUR3DISC	DISC and inflation in $t_0 + 3$ below inflation in $t_0 - 2$	Authors	Dummy variable
TAXGDP	General government revenue (percent of GDP)	WEO	Decimal fraction
TAXGDPM3	General government revenue (percent of GDP), three-year backward average	WEO	Decimal fraction
TT	Terms of Trade	WEO	Index
TTG	Terms of Trade growth	WEO	Percent per year (decimal fraction)
TTGM3	Terms of trade growth, three-year backward average	WEO	Percent per year (decimal fraction)
TTGS3	Terms of trade growth, three-year centered standard deviation	WEO	Percent per year (decimal fraction)
UIC	Upper-income countries (constant for sample)	World Bank	Dummy variable
UMIC	Upper-middle-income countries (constant for sample)	World Bank	Dummy variable
USGDP	U.S. real GDP	WEO	Billions, national currency, constant prices
UUMIC	Upper- and upper-middle-income countries (constant for sample)	World Bank	Dummy variable
XG	Exports of goods and services, volume growth	WEO	Decimal fraction
XGDP	Exports of goods and services (percent of GDP)	WEO	Decimal fraction

Table A2.1
(continued)

Variable	Description	Source[a]	Units[b]
XGM3	Exports of goods and services, volume growth, three-year backward average	WEO	Decimal fraction
XGRESREG	Deviation of export/GDP ratio from predicted value at time of adoption of exchange rate regime	Authors	Decimal fraction
XPORT3	Share of total exports to three largest trading partners	DOTS	Percent
YRS	Annual dummies		Dummy variable

[a] Data are derived from the following sources: WEO—World Economic Outlook database, IMF; IFS—International Financial Statistics, IMF; INS—Information Notice System, IMF; DOTs—Direction of Trade Statistics, IMF.
[b] Percentages are expressed as decimal fractions; for example, 10 percent is 0.10.

Notes

Chapter 1 Introduction

Fischer 2001b; Roubini 1999; Hanke 2000b.

1. For simplicity, we use the term *dollarization* generically to mean the unilateral adoption of any foreign currency as legal tender in the country.

2. Deviating from this trend, St. Helena adopted the system in 1976 (Hanke and Sekerke 2003).

3. Given the predominant focus on the euro boards in this book, we do not examine the case of Hong Kong (SAR) in detail. See Jao 1974 for an analysis of Hong Kong's first currency board. See Kwan and Lui 1996; N'Diaye 2003; Ramkishen and Siregar 2002; Tsang 2000, 2004; and Tsang and Ma 2002 for the second board.

4. Argentina had first adopted a currency board exactly a century before; the first board remained in place—with some interruptions—from 1891 to 1935 (Paolera and Taylor 2001).

5. A number of other regimes, including the African CFA franc zone and Singapore, display some of the features of currency boards but do not meet our full definition, reviewed later.

6. See Krugman 1998, Schuler 1998, and Culp, Hanke, and Miller 1999.

7. Hanke 1998a, 1998b.

8. See Hanke 2000c for a general discussion.

9. See Dornbusch 2001.

10. See Dornbusch 2001.

11. See Hanke 2003b.

12. See Smith 1999.

13. See, among others, Schwartz 1993, Bennett 1994, Hanke and Schuler 1994, Humpage and McIntire 1995, Williamson 1995, Balino and Enoch 1997, Calvo et al. 1997, Kopcke 1999, Janssen 2001, and Hanke 2002.

Chapter 2 Currency Boards in Historical Perspective

1. Non-British boards included Argentina (Paolera and Taylor 2001), the Philippines, Panama, North Russia (Hanke and Schuler 1991), Danzig, Ireland, Italian Somaliland, Libya, Sudan, North Yemen, Swaziland, and Lesotho. See Schuler 1992 for a comprehensive review.

2. While fears of monetary mischief by colonial authorities played a role, by the heyday of the early boards local authorities already faced restrictions on monetary issues. In most cases the introduction of boards did not take place in the aftermath of monetary crisis or high inflation, though in some cases financial volatility preceded the adoption.

3. Classic comprehensive works on currency boards include Chalmers 1893, a series of articles in *The Banker* during 1948–1949, Shannon 1952, and Greaves 1950, 1953. Recent literature is relatively sparse; notable exceptions include, among others, Schuler 1992; Schenk 1997; Treadgold 2003, 2005, 2006.

4. The sample of early boards includes those in colonies, dependent territories, and independent countries.

5. The West and East African currency boards are reviewed in detail in Greaves 1953, Newlyn and Rowan 1954, Loynes 1962, Hopkins 1970, and Letiche 1974. Recent analyses include Vice 1983, Schenk 1997, and Treadgold 2006.

6. Hong Kong and Ireland differed formally though not substantively from the standard setup as private banks were granted note issue privileges. The private issues had to be fully backed by sterling deposits with the Hong Kong government and Irish monetary authority. Box 2.2 takes a closer look at the Irish case.

7. A number of boards operated under an alternative model of locally based "Currency Commissioners." In practice, the difference was small, as both arrangements required the approval of the Colonial Office. See Abbott 1959 for a history of the Crown Agents.

8. The board initially included a commercial banker from the Bank of British West Africa (BBWA) (which acted as the board's agent). In 1942 a representative of the Bank of England replaced the retiring BBWA member. A Treasury staff member attended virtually all board meetings as an "honorary member."

9. Wartime restrictions on shipping limited the board's ability to add coinage; the WACB responded by a temporary introduction of British notes and decided in 1916 to introduce WACB notes, a step originally only envisioned for a later date.

10. In the case of the WACB, money demand and supply swelled in autumn and winter as traders paid for the cocoa and groundnut crops in cash, before falling back in spring (Clauson 1944).

11. As Baster (1929) puts it, British Imperial Banks were "very respectably fathered" and "formed in London a compact and homogeneous group, connected among themselves or with the English domestic banks, by a comprehensive system of interlocking directorates" (120).

12. See also Hanke and Walters 1992.

13. Reviewing the prior literature, Treadgold (2003) concludes, "Taken as a whole, these studies of colonial currency boards clearly failed to offer much empirical support for the deflationary bias hypothesis" (64). He contends that increases in velocity, the monetary

base, and the money multiplier inhibited the deflationary bias in Fiji, Ghana, Jamaica, and—with the exception of the money multiplier—Malaya. In contrast, Treadgold observes for the Philippine currency board case that "although the circumstances of this study are unusual, the evidence that has been assembled and analysed seems consistent with the basic theory of pure deflationary bias" (74).

14. See, among others, Greaves 1950, 1953; Hazlewood 1952, 1953; Newlyn and Rowan 1954. Schenk (1997) provides an excellent critical summary. Treadgold (2006) evaluates the seigniorage debate.

15. See Schenk 1997 and Uche 1997 for this interaction in the case of Nigeria.

16. In the case of the WACB, Ghana was the first to leave in 1958, followed by Nigeria in 1959, Sierra Leone in 1961, and, a decade later, The Gambia in 1971.

17. The WACB honored the convertibility promise, exchanging the tendered notes and coins of leaving members for sterling, thus creating the initial reserve basis of the new central banks, as well as distributing part of its excess reserves. Having completed the exchange, the WACB closed down in 1973.

Chapter 3 Why Do Countries Choose Currency Boards?

1. Although a full monetary union represents the strongest commitment to maintain a fixed parity between two former currencies, we do not classify it as the most extreme end of this spectrum since it becomes indistinguishable from a national currency in terms of the central bank's ability to conduct monetary policy, act as lender of last resort, or choose the exchange rate regime vis-à-vis third currencies.

2. In the sole instance of an exit from a modern currency board adopted in the 1990s—Argentina, explored further in chapter 8—the exit was accompanied by substantial political upheaval.

3. We treat monetary unions as a distinct case, however, because—in contrast to unilateral adoption of a foreign currency (dollarization)—under a monetary union the country is still able to exert influence on the conduct of monetary policy for the common currency area and any lender-of-last-resort operations through its vote on the board of the bank, and typically receives a share of seigniorage.

4. The term is used generically here to describe cases where the country unilaterally adopts a foreign currency, be it the U.S. dollar or some other currency.

5. These advantages, of course, also apply to a well-communicated, preannounced exchange rate path. Frankel, Schmukler, and Servén (2000), however, argue that a basket peg (with a fixed parity) will have less credibility than a single currency peg because the private sector has problems in verifying that the central bank is indeed adhering to the peg.

6. The rules can, of course, be adjusted. In early 1995, faced by a capital outflow amounting to almost one-quarter of bank deposits in the aftermath of the Tequila crisis, the Argentine authorities reduced the reserve coverage required under the currency board arrangement.

7. Interest rates in the Turkish interbank market reached more than 1,000 percent per year during a speculative attack on the quasi-currency board arrangement in November 2000.

8. Whatever the reasons, experience strongly suggests that devaluations are politically very costly. Cooper (1971) found that in the aftermath of devaluations nearly 20 percent of governments fell within twelve months (compared to 14 percent for governments that did not have a devaluation). Updating the study, Frankel (2005) finds that within six months of a devaluation, the chief executive loses office 22.8 percent of the time (compared to only 11.6 percent in the control group of no devaluation) and, in the year following the devaluation, the Finance Minister or Central Bank Governor loses his office 58.3 percent of the time (compared to 35.8 percent of the time when there is no devaluation).

9. As discussed in chapter 5, however, little empirical evidence exists that pegged exchange rate regimes in fact encourage more liability dollarization.

10. The Mundell-Fleming results imply that fixed exchange rates, high capital mobility, and an independent monetary policy form an "impossible trinity."

11. As discussed in Ghosh, Gulde, and Wolf 2003 (chapter 3), a large body of literature exists that examines the precise conditions and configuration of shocks under which fixed or floating exchange rates are preferable for insulating output.

12. Hedging opportunities are much more limited for cross-border investments that have longer gestation periods, but the impact of uncertainty on investment is at least theoretically ambiguous (Caballero 1991).

13. See Baldwin 2005.

14. For the euro-based currency boards, longer-term real integration with the EU is, however, an important, if arguably secondary, objective.

15. As shown later, under discretionary monetary policy, the optimal inflation (and, therefore, devaluation) is directly related to this productivity shock. This shock thus captures the exchange rate misalignment that may occur under a pegged exchange rate or currency board regime.

16. This is not to suggest that the banking system is not important. In particular, an important source of vulnerability under currency board regimes is the limitation on the central bank's lender of last resort function. This is not captured by the formal model.

17. For a simple theoretical exposition of the role of OCA criteria and credibility in exchange rate regime choice, see also Berger, Jensen, and Schjelderup 2001. Berger, Sturm, and De Haan (2000) provide empirical evidence that both determinants influence actual exchange rate regime decisions.

18. As shown in chapter 6, both central bank independence and pegged exchange rate regimes are associated with lower inflation.

19. The optimal policy for the central bank is given by substituting $\pi^e = 0$ into equation (11).

20. For a discussion of the relative merits of dollarization versus a currency board, see Berg and Borensztein 2000.

21. A more extreme example was when the Hong Kong (SAR) monetary authorities purchased stocks to help shore up the stock exchange during the Asian crisis using some of the excess reserves coverage under the currency board arrangement.

22. Indeed, as Indonesia's experience in late 1997 showed, even under a floating regime, in practice the central bank's ability to act as lender of last resort is circumscribed if it is

to avoid a complete collapse of the exchange rate (which, in turn, may exacerbate the effects on the banking system of exposure to foreign currency denominated debt).

23. Whether and how fast a monetary authority can achieve credibility for the hypothetical case of operating discretionary policy by successfully adhering to a rule is an interesting open question.

24. To simplify the algebra, and without loss of generality, we assume hereafter that the growth of money demand does not depend on expected inflation ($v = 0$).

25. It can be shown that

$$z(0) = \frac{A^2\theta^2\sigma_\eta^2}{2(1+A\theta^2)} - \frac{1}{2}(1+A\theta^2)\sigma_\varepsilon^2 - \frac{1}{2}A^2\theta^2(1+A\theta^2)^2\bar{y}^2$$

and

$$Z(1) = \frac{A^2\theta^2\sigma_\eta^2}{2(1+A\theta^2)} - \frac{A^2\theta^2\bar{y}^2}{2(1+A\theta^2)} - \frac{\sigma_\varepsilon^2}{2}.$$

Chapter 4 Modern Currency Boards: Structural and Institutional Aspects

1. Extensive discussions of design elements are provided in Hanke and Schuler 1994, Tsang 1999, Enoch and Gulde 2000, and Ho 2002. Tsang and Ho structure their analysis around the six most recent currency boards (Argentina, Bosnia and Herzegovina, Bulgaria, Estonia, Hong Kong, and Lithuania). Hanke and Schuler (1994) also draw on the experiences of the classic boards.

2. In the case of Bosnia and Herzegovina, political neutrality was interpreted even more broadly to exclude governors from the region, a constraint resolved by the appointment of a New Zealander.

3. In practice, the credibility bonus achievable by legally embedding the board depends on the sanctity of the rule of law and the stability of the political system (Tsang 1999).

4. Argentina explored but did not implement a euro and dollar basket anchor. Turkey's quasi–currency board arrangement (box 4.2) used a basket of the dollar and the euro. The pre-1998 European boards were able to partly sidestep the issue because the choice of the deutsche mark through the European Monetary System (EMS) linkage indirectly translated into a de facto basket anchor.

5. Hong Kong changed the anchor to the U.S. dollar in its second currency board, albeit some years after abandoning the prior board.

6. The choice implies that unless CBAs hold excess reserves, deposits may trade at a *disagio* to cash in times of financial crisis.

7. Some authors use a higher minimum coverage requirement (Hanke and Schuler 1994). In practice, the East Caribbean arrangement (ECCB) is the only system with a reserve coverage ratio above 50 percent but below 100 percent of the chosen aggregate. Other countries—most notably, the CFA (Communaté financière d'Afrique/Coopération financière en Afrique centrale) countries—have a coverage requirement below our threshold. Most countries operating CBAs have in practice full and even excess coverage.

8. An alternative would be to impose an incremental flow reserve requirement independent of the stock coverage ratio.

9. A distinct argument in favor of limited excess reserves rests on their ability to act as a buffer against valuation effects, such as interest rate effects on the market value of longer maturity debt. The volatility of reserve asset values can alternatively be reduced by restricting the eligible maturities, though generally at a cost in terms of reserve portfolio returns.

10. While the parity—and thus the reserve coverage—can be changed at a future point, doing so would likely impair credibility, limiting the option to cases of severe misalignment. The 50 percent CFA devaluation of 1994 after thirty-five years of operating under the same parity provides one of the few examples of a parity change in a long-established peg with a legal reserve requirement.

11. Conversely, structural changes in the economy such as greater labor market flexibility or closer integration with the anchor country, which may even come about because of the currency board regime, could reduce the costs of not being able to adjust the nominal exchange rate.

12. For a more general literature on exiting pegged exchange regimes, see Eichengreen and Masson 1998, Eichengreen et al. 1999, Agénor 2004, and Duttagupta, Fernandez, and Karacada 2004.

13. Such an arrangement was in use in pre-1951 Cuba and in Panama since 1904 (domestic coins only) and has been examined for other countries such as Montenegro (Bogetic and Hanke 1999; Hanke 2000a). The system differs from the much more common case in which an external currency is tolerated as a secondary money but does not carry legal tender status.

14. An oft-quoted example is El Salvador's unilateral dollarization in 2001.

15. Examples include Liechtenstein post-1980, Panama post-1904, Monaco 1945, and the German Democratic Republic from July to October 1990.

16. Examples include Kosovo 1999 and East Timor 2001.

17. While dollarization trivially eliminates the currency risk on notes and coins, domestic deposits remain subject to a future forced conversion into a new national currency, and thus to a residual currency risk. See Schmukler and Servén 2002 for a discussion of currency risk under CBAs.

18. Sharing arrangements are in place among Lesotho, Namibia, and South Africa. One recent attempt in this direction has been the Mack Bill introduced to the United States Senate in 1999, followed by the International Monetary Stability Act of 2001 introduced in the United States House of Representatives in 2001. The proposals recognized the additional seigniorage obtained by the United States Treasury as a result of official dollarization and proposed a sharing mechanism. The bills were opposed by the U.S. Treasury and did not pass Congress. Barro (1999) considers as an alternative a one-time transfer equivalent to the outstanding monetary base at the time of dollarization.

19. While there is no legal prohibition that would prevent the Federal Reserve System to open its discount window to foreign banks, in practice even banks in Panama, with its long tradition of dollarization, have no access to the Federal Reserve System as lender of last resort (Gruson 2002).

20. Conceptually, there may be an offsetting credibility effect to the extent that financial markets expect that the CBA countries would prefer a more expansionary policy absent the strictures of the CBA and would be able to give weight to these preferences in the course of EMU policy making, an influence excluded in classical dollarization.

21. As with any other index, the precise rankings depend upon the weights given to each component, which are subjective. Nevertheless, the index yields broadly sensible results—with Bosnia and Herzegovina and Estonia ranked the strictest, slightly above Bulgaria—but the relative rankings of Argentina and Lithuania more debatable because they depend on relative importance accorded to reserve composition rules and lending limits.

Chapter 5 Stylized Facts

1. "Floating regimes" consist of crawling pegs, target zones and bands, other rule-based flexible regimes, managed floats with light or heavy intervention, and independent floats; the latter category includes monetary unions where the union itself floats (mainly EMU). "Other pegged regimes" consist of single currency pegs, monetary unions with the exchange rate fixed to an outside currency (mainly CFA countries), and basket pegs with either announced or secret baskets. Unilaterally dollarized economies (mainly Panama and Ecuador, post-1999) are excluded from the dataset.

2. The Tornell and Velasco (1995) hypothesis that pegged rates, by postponing the day of reckoning, might lead to higher fiscal deficits receives some support in the data since fiscal deficits average 5.4 percent of GDP under traditional pegs but only 4.5 percent of GDP under floats. Currency board countries, however, do not follow this pattern, with an average fiscal deficit of only 2.5 percent of GDP.

3. Caution is indicated in interpreting these figures as interest rates are not comparable across countries and, in some instances, may have been set administratively.

4. These data, based on Glick and Hutchison 2001 and updated by us, cover the period 1975–2002.

5. The classification is applied consistently. Thus we include the year 2001 as a banking crisis in Argentina under currency boards, even though, as detailed in chapter 8, the crisis was arguably caused by the default on government debt rather than by the currency crisis.

6. Arteta (2002) argues that, if anything, floating regimes seem to exacerbate, rather than ameliorate, currency mismatches in domestic financial intermediation, because those regimes seem to encourage deposit dollarization more strongly than they encourage matching via credit dollarization.

Chapter 6 Inflation and Disinflation under Alternative Exchange Rate Regimes

1. Hong Kong is a partial exception, though inflation was higher at the point of readopting the board than it had been while Hong Kong previously operated under a currency board.

2. An illustration is provided by the—structurally quite similar—Baltic countries (see chapters 10 and 11). Estonia chose a currency board in 1991 and has maintained it; Lithuania followed a few years later, but actively considered an exit to a soft peg, while Latvia has a peg.

3. Inverting a money demand function and taking first differences yields $\pi = \Delta m - \alpha\Delta y$, where α is the income elasticity of money demand.

4. To derive the indirect effect of the exchange rate regime on inflation, suppose that the growth rate of the money supply depends upon the exchange rate regime: $\Delta m = \alpha_0 + \alpha_1 Peg + \alpha_2 Flt + \eta$, where *Peg* and *Flt* are dummy variables representing (other) pegged regimes and floating regimes respectively, and where α_0 captures money growth under a currency board (since it is the omitted category) and η is a random shock. Suppose further that the inflation rate depends upon money growth, the exchange rate regime, and a vector of other conditioning variables, z: $\pi = \beta_0 + \beta_{Peg} Peg + \beta_{Flt} Flt + \beta_{Mon}\Delta m + \beta_j z_j + \varepsilon$, then the indirect effect of the pegged exchange rate regime is given by $\beta_{Mon}\alpha_{Peg}$. But since *Peg* is a dummy variable, an estimate of α_{Peg} is given by the difference in the average growth rates of the money supply under pegged regimes and currency boards: $\alpha_{Peg} = \Delta\bar{m}_{Peg} - \Delta\bar{m}_{Cbd}$ so the indirect effect is $\beta_{Mon}(\Delta\bar{m}_{Peg} - \Delta\bar{m}_{Cbd})$.

5. In the base regression, there are 61 observations with currency boards, 1,021 observations classified as "other pegged regimes," and 1,107 observations with floating exchange rate regimes.

6. Growth performance under currency boards relative to other exchange rate regimes is examined more closely in chapter 7.

Chapter 7 Output Growth and Trade Performance

1. Trade openness, terms-of-trade volatility, years of schooling, fiscal balance, and country size (as proxied by population size).

2. Of course, the same could equally apply to any fixed exchange rate regime, but unlike under a simple peg, a step devaluation (if competitiveness has been lost over time) is generally not an option under a currency board.

3. The "expected value" of the export ratio is derived from a regression of the export-to-GDP ratio on population size and on the squared distance-weighted sum of world GDP:

$$x^i/GDP^i = \alpha_0 + \alpha_1 \sum_{j=1}^{n} \frac{GDP_j}{d_{i,j}^2} + \alpha_2 \log(Pop^i),$$

where the coefficients are $\alpha_1 = 0.26 \times 10^{-5}$ (t-stat: 2.52**), and $\alpha_2 = -0.065$ (t-stat: 34.3***); $R^2 = 0.07$, where ** and *** indicate statistical significance at the 5 and 1 percent levels, respectively.

Chapter 8 Argentina

Krugman 2002; Edwards 2002; Lagos 2000.

1. Intriguingly, Argentina is also the only country to twice adopt (and exit) a currency board; the earlier episode is recounted in chapter 2. Throughout this chapter, we refer to the exchange rate regime instituted as part of Argentina's Convertibility Plan as a "currency board," although some commentators have stressed that the regime did not fully satisfy the defining characteristics of a CBA; see Schuler 2005 and the discussion in chapter 4.

2. Corrales (1997) provides an account of Cavallo's career and the politics behind the passage of the Convertibility Law. In fact, Cavallo had been making his argument at least as early as 1990, but a major stumbling block was the overhang of australes still in circulation. This was cleared through what amounted to a monetary confiscation under the Plan Bonex—which Cavallo was careful not to be associated with—paving the way for the Convertibility Plan.

3. Later changed to 1 peso per 1 U.S. dollar following the 1992 monetary reform converting 10,000 australes into 1 new peso.

4. As part of the effort to strengthen the banking system after the Mexican crisis, Argentina increased the minimum capital adequacy requirement to 11.5 percent of risk-weighted assets and tightened the regulatory and supervisory environment (which led to a consolidation of the banking sector), established a privately funded deposit insurance system, and implemented a liquidity requirement equivalent to 20 percent of bank deposits.

5. See the discussion in chapter 4 and Camilleri Gilson 2004.

6. See Daseking et al. 2005 on the reasons why growth already began to slow in the first half of 1998.

7. See Schmukler and Servén 2002 for the behavior of the peso/U.S. dollar interest rate differential under Argentina's currency board. Calvo (1999) discusses some of the advantages of dollarization, including a scheme whereby Argentina would be able to recapture the lost seigniorage. For a broader discussion of the merits of dollarization, see Velde and Veracierto 2000 and Goldfajn and Olivares 1999.

8. Including a financial transactions tax, an increase in tariffs, a maturity lengthening of public debt, and the introduction of a preferential exchange rate for exporters.

9. See Cavallo 2002a, 2002b for a personal account of the ensuing episode.

10. Under this mechanism, introduced in June 2001, exporters received a reimbursement, and importers paid a tax, equivalent to the difference between the exchange rate pegged to the U.S. dollar and that on a corresponding equally weighted euro/U.S. dollar basket. By construction, the convergence factor would disappear when the euro reached parity with the U.S. dollar.

11. In turn, this prompted Argentineans to withdraw their foreign currency deposits from Uruguayan banks, helping trigger a financial crisis in that country.

12. Mussa (2002) and Feldstein (2002) focus on fiscal policy and external indebtedness. Calvo, Izquierdo, and Talvi (2002) explore the combination of a sudden stop of capital inflows, fiscal ill discipline, and constraints faced by the Argentine economy. De la Torre, Levy-Yeyati, and Schmukler (2002) examine the interaction between the currency board regime and the banking system. Perry and Servén (2002) conclude that the crisis resulted from the interaction of multiple vulnerabilities, including domestic policy responses (or

the lack thereof). Hausmann and Velasco (2002) likewise argue that no single factor can explain the crisis. Daseking et al. (2005) consider various alternative explanations and conclude that fiscal ill discipline—which the currency board did little to resolve—together with constraints imposed by the CBA and a series of exogenous shocks and policy mistakes were responsible for the crisis.

13. De la Torre, Levy-Yeyati, and Schmukler (2002) provide an in-depth assessment of the link between the banking system and the currency board in the crisis, arguing that an early dollarization could have avoided the crisis or at least sharply reduced its costs. See also Calomiris and Powell 2001.

14. Hristov (2002) and Hanke and Schuler (2002) argue that Argentina's real exchange rate was not much overvalued; Sachs and Larrain (1999) argue the opposite; see also Powell 2002 and Hausmann and Velasco 2002.

15. A counterargument attributes the small tradables share in GDP itself to the real exchange rate appreciation experienced under the currency board before the downturn. In this argument, although export growth had been quite robust under the currency board, it started from a very low base, and with a more flexible regime, export growth would have been faster. While several other countries that experienced rapid growth in exports generally did so in the context of depreciating real exchange rates, it is difficult to establish what would have happened to Argentina's export performance had it not adopted the currency board. In particular, while the real exchange rate appreciation might have been lower absent a currency board, so might the macroeconomic stability obtained; in that case, exports (and the economy generally) would have arguably performed much worse.

16. With an export volume increase of only 2.5 percent.

17. It is more plausible that slowing economic activity in Argentina's trading partners was responsible for the deterioration in export performance. For instance, real import growth of goods and services by Argentina's trading partners declined from 5.3 percent in 1998 to −4.4 percent in 1999, although it recovered sharply in 2000 (11 percent) before declining again to 1.8 percent. Between 1991 and 1997, the average growth rate of real imports by Argentina's trading partners was 12.6 percent.

18. A monetary conditions index, incorporating interest rates, the real exchange rate, and the output gap, shows tightening in monetary conditions in late 1998 and early 1999, but this primarily reflects rising real interest rates in the face of capital flow reversals and real exchange rate appreciation. While a higher real exchange rate may be indicative of tightened monetary policy under a floating exchange rate regime (i.e., where the monetary authorities have control over the nominal exchange rate through monetary policy), it is less clear that it indicates monetary tightening under a fixed exchange rate regime (where the nominal exchange rate is fixed and the real appreciation reflects either inflation or depreciation by a trading partner).

19. Argentine real interest rates did rise sharply in the latter half of 2001, reaching 40–50 percent by year-end as it became increasingly apparent that the exchange rate regime and the debt dynamics were unsustainable, but this can hardly explain the recession that had started in 1998.

20. A more formal analysis is undertaken in Daseking et al. (2005), who estimate banking system credit supply and demand functions explicitly allowing for the possibility of credit rationing. In that framework, credit supply is assumed to depend upon banks'

lending capacity and the real lending interest rate, while credit demand is assumed to depend upon the real lending interest rate and the level of real GDP. The results suggest that the decline in real credit during the post-1998 period mostly reflected falling credit demand rather than a reduction in credit supply, essentially because of rising interest rates. Accordingly, there is little evidence of quantity rationing.

21. See Thomas 2002 for a detailed discussion.

22. The correlation between an (inverted) index of consumer confidence (higher score indicates lower confidence) and sovereign spreads is 0.55 (t-stat: 4.16**).

23. Sir Arthur Conan Doyle, *The Sign of Four* (1890).

24. Velasco (2001), by contrast, argues that slow growth—including that under the currency board regime—helped cause Argentina's crisis.

25. For example, the original targets (and outcomes) for the consolidated public sector's primary balance in 1999–2001 were 1.4 percent of GDP (−0.7 percent of GDP), 1.3 percent of GDP (0.4 percent of GDP), and 2.7 percent of GDP (−1.4 percent of GDP), respectively.

26. Powell (2002) concludes that both the fiscal and the debt problems remained within the range where feasible adjustments would have stabilized the situation.

27. For an in-depth analysis (and ultimate rejection) of the fiscal explanation of the Argentine crisis, see Hausmann and Velasco 2002. See Mussa 2002 for a different take. Edwards 2002 emphasizes the lesson that the adoption of a CBA does not by itself lead to prudent fiscal policies.

Chapter 10 Estonia

Cited in The Economist 1997, p. 69.

1. For a review of the early experience, see Bennett 1992, Buch 1993, and Funke 1995. Osband and Villanueva (1992) provide an overview of independent currency authorities.

2. Later changed to a euro peg at the DM/Euro conversion rate (Ross and Lättemäe 2004).

3. Financial crisis in the Baltics are discussed in, among others, Hansson and Tombak 1996; Lopez-Claros and Garibaldi 1998; de Haan, Berger, and van Fraassen 2001; Enoch, Gulde, and Hardy 2002.

4. Most of the banking problems seem to have originated in ineffective supervision, which allowed poor banking practices and weak credit risk assessment skills, insider abuse, overextension of the banks' branch network, violations of regulatory provisions, and undercapitalization (de Haan, Berger, and van Fraassen 2001). See also Lopez-Claros and Garibaldi 1998.

5. For a time, unilateral euroization was considered, but, being greeted less than warmly by the European Central Bank (ECB) and the European Union (EU), quickly dropped—not least for political-economic reasons: "The central bank is not cursed with blindness. Estonian society has understood that we do not engage in academic surrealism. . . . At the moment the whole world associates simple and unilateral euroization or dollarization

with countries that have serious economic problems. . . . Tactically, it would be extremely inadvisable to fall to the above list" (Kraft 2000, 2–3). Sulling (2002) discusses euroization as a (now mostly theoretical) policy option for Estonia during the post-EU and pre-euro area accession period.

6. Since the late 1990s, foreign banks have controlled more than 95 percent of the Estonian banking sector, with the two largest Swedish-owned banks alone accounting for more than 80 percent (Sulling 2002).

7. A medium-sized bank (The Land Bank of Estonia) collapsed roughly at the time of the Russian crisis, and two smaller banks ran into trouble in the autumn of 1998 (Sepp and Randveer 2002). See the previous discussion on financial market policies.

8. The European Central Bank (2004) credits "sound fiscal policy since the beginning of Estonia's transition to a market economy" (67) with providing critical support for the process of disinflation under the CBA.

9. Counteracting the general view of a highly flexible labor market is the persistence of double-digit unemployment, suggesting some remaining structural impediments (European Central Bank 2004).

10. Absent a comparable debt instrument, the Maastricht convergence criterion for long-term interest rates cannot be assessed. Given Estonia's overall fiscal performance, however, the EU and ECB do not see grounds for believing that the criterion would be violated if it could be assessed. See European Central Bank 2004.

Chapter 11 Lithuania

Kregždė 2000a, p. 94.

1. Schuler, Selgin, and Sinkey (1991) provide a review of the early period.

2. See Bank of Lithuania 2005.

3. Alonso-Gamo et al. (2002) provide a detailed discussion of the origin and performance of the Lithuanian CBA.

4. While the backing requirement is in gross terms, the Bank of Lithuania "strives to maintain full backing with net foreign assets" (Kregždė 2000b).

5. Jurgilas (2005) discusses remaining instruments and efficiency considerations.

6. The authorities made use of the relatively weak structure of the CBA by collateralizing a dollar loan from a German bank with foreign exchange reserves of the Bank of Lithuania (eventually repaid prior to term) (Camard 1996).

7. The episode illustrates the desirability of addressing banking system problems prior to the adoption of a CBA (Enoch and Gulde 1998).

8. During the Swedish banking crisis from 1991 to 1992, the central bank increased its credit to commercial banks by the equivalent of more than 40 percent of reserve money outstanding at the beginning of the period. The corresponding increase in Lithuania remained in the single digits.

9. See Kregždė 2000a. The authorities received technical assistance from various sources, including the IMF, on exiting the currency board regime.

10. At the time, some ambiguity remained over whether a currency board was consistent with ERM-II. The issue was later resolved, with both Estonia and Lithuania opting to retain their CBA during ERM-II as a unilateral choice not entailing additional support obligations for the other member states.

11. The need for repegging was strong even without looming EU accession because Lithuania's trade pattern over the 1990s had shifted from dollar to euro trade. Exports to the EU had increased from less than one-third to nearly half of total exports, while exports to the former Soviet Union had declined from about half to less than 20 percent.

12. See Abazorius 2000 for a discussion of Bank of Lithuania policy in the run-up to EU accession.

13. Bonato and Leigh (2005) provide a detailed analysis of the inflation performance.

14. The weight of HICP category 045 (electricity, gas, and other fuels) is 9.4 percent in Lithuania, contrasted with the EU-25 average of 4.7 percent. Estonia (8.0 percent) and Latvia (8.5 percent) are similarly exposed to further energy price increases.

Chapter 12 Bulgaria

1. During two waves of bank closures in 1995 and 1996, banks accounting for more than 30 percent of the banking system's assets were shut down. To restore credibility following the drawn out systemic crisis, the government guaranteed that the second wave of bank closures was final. The effect of the leva devaluation had a positive effect on banks' balance sheets because they held dollar denominated bonds (so-called Zunk bonds), which had been issued during a previous round of recapitalization. The value of these bonds exceeded the value of banks' dollar denominated liabilities.

2. Bank deposits include required and free reserves. Reserve requirements are seen as a prudential tool and have to be satisfied on average over the month, providing some shorter-term flexibility.

3. To enhance credibility, the BNB applies a minor charge for selling leva but not for the purchase of foreign exchange.

4. The central banks' full accounts include both the balance sheet of the banking and the issue department. The full accounts are published monthly.

5. These funds are best viewed as excess reserves, as they do not have a counterpart in monetary liabilities of the Bulgarian National Bank as a whole until they are used as part of a LOLR operation. The initial amount allocated for that purpose was about US$300 million, about 20 percent of the outstanding reserve money.

6. Central bank profits will increase the deposit of the banking department with the issue department, with a balancing increase in the capital and reserves account in the banking department.

7. See Nenovsky and Hristov 2002, and Valev and Carlson 2004, among others.

8. All government accounts and the accounts of twelve extrabudgetary funds were consolidated in the FRA. The balance in the FRA is held in the Issues Department and fully covered by foreign exchange reserves. Under the initial IMF-supported programs, a monitorable minimum balance was to be maintained in the FRA.

9. The decision to retain government deposits with the Bulgarian National Bank reflected practical concerns given the weakness of the commercial banking system.

10. An IMF drawing will initially increase the Banking Department's deposit with the Issue Department, thereby increasing the amount of reserve money. When it is on-lent to the government, government deposits will increase and the Banking Department deposit at the issue department decrease, initially leaving the level of reserve money unchanged. It will eventually decline, however, as the government spends the funds.

11. Under the initial programs, the authorities needed IMF approval for a change in required reserves.

12. While the Asian and Russian crises had spillover effects mainly through changes in the financial conditions for emerging markets, the Balkan crises also affected vital transportation links with Europe.

13. For a discussion of competitiveness issues, see Chobanov and Sorsa 2004 and Dietz 1997.

14. Unilateral euroization was never a policy position, but the pros and cons were discussed in academic work (Kostov and Kostova 2002).

Chapter 13 Bosnia and Herzegovina

Nicholl 2001, p. 2.

1. Including the deutsche mark throughout the entire country, as well as the Bosnia and Herzegovina dinar, the Yugoslav dinar, and the Croatian kuna in parts of the country. The Bosnia and Herzegovina dinar was "issued (generally) in accordance with currency board rules" (Coats 1998, 5).

2. Symbolism played a significant role in many decisions surrounding the currency board. Bank notes carry both Roman and Cyrillic script, with the ordering varying across notes.

3. A system of three regional currency boards with the same parity rate was also discussed, but thought to be less conducive to nation building than a national currency board.

4. See Coats 1999 for an account of the creation of the currency board and Kovaĉević 2003 and Kamhi and Dehejia 2005 for recent appraisals. The Central Bank of Bosnia and Herzegovina (CBBH) Web page at www.cbbh.gov.ba/en/index.html provides detailed institutional background as well as statistical information.

5. The law does not allow for a spread between bid and ask rates for the CBBH and furthermore requires commercial banks and other financial institutions to buy and sell KM for DM "without restriction, fees, commissions or other charges" (art. 33:2).

6. In effect, use of excess reserves and the required reserve ratio are thus the only monetary policy instruments, though the latter is primarily directed at financial stability rather than macroeconomic objectives. Following a revision in 2003 aimed at improving the CBBH flexibility, the reserve ratio applies to both KM and foreign exchange deposits and has to be satisfied by deposits at the CBBH. The CBBH can set the rate between zero and 20 percent, and it enjoys some flexibility in setting the compensation.

7. Specifically, the governor could be a citizen of neither Bosnia and Herzegovina nor any neighboring state. Following a brief stint by Serge Robert of France, the governorship was assumed in November 1997 by Peter Nicholl, a former deputy governor of the Reserve Bank of New Zealand.

8. To date, the sharp increase in lending has not been accompanied by rising nonperforming loan ratios. Some measures have been taken to safeguard against excessive lending, however, notably an extension of reserve requirements to include foreign currency liabilities.

9. Between 1997 and 2003, 12.1 billion KM were issued to banks and 9.9 billion bought back, for a net issue of 2.2 (Nicholl 2003, 3).

10. Reviewing findings, the International Monetary Fund (2005e) concludes, "All this evidence suggests that, indeed, Bosnia and Herzegovina's GDP is underestimated, likely up to 50 percent" (7).

11. As former CBBH Governor Peter Nicholl (2001) notes, unless efforts are made to make BH an attractive destination for foreign private capital, "The BH economy will have major foreign exchange problems and the currency board will be unable to protect the country from those shocks. Indeed, it could become one of the victims of those shocks as politicians look for scapegoats to explain the country's economic problems to the people" (3).

12. See also Kamhi and Dehejia 2005.

Chapter 14 Euro-Based Currency Boards: An Assessment

1. See Burgess, Fabrizio, and Xiao 2003 for a detailed analysis.

2. See Deutsche Bundesbank 2001 and European Commission 2002 for surveys. Most estimates place the effect at 1–2 percent for the central European economies, and less for the Baltics. Recent work by Égert, Halpern, and McDonald (2005), however, suggests that the contribution of the Balassa-Samuelson effect may be smaller than previously thought, concluding that "the trend appreciation usually observed for the exchange rates of these economies is affected by factors other than the usual Balassa-Samuelson effect, which is probably not an obstacle for meeting the Maastricht criterion on price stability for those countries facing this challenge" (40). See also Égert and Halpern 2006 for an assessment of equilibrium exchange rates in the region and Égert et al. 2003.

3. See De Broeck and Sløk 2001; Égert, Halpern, and McDonald 2005; and Égert and Halpern 2006.

4. The signaling effect of maintaining or exiting a CBA point remains under debate; see Sinn 1999 and Katsimi 2003 for different takes.

5. The argument extends to Bosnia and Herzegovina, with Bulgaria arguably an intermediate case.

6. The case for early entry is less clear from a traditional OCA perspective. In a meta-analysis of studies of business-cycle correlations of accession countries with the old EU (Fidrmuc and Korhonen 2006, Figure 14.1), Estonia places in the middle field with a median correlation of about 0.1, while the median correlation for Lithuania is negative. In contrast, median correlations for Hungary and Poland are in the 0.3 range, while the

median correlation for Slovenia comes in at 0.25. The higher exposure to asymmetric shocks has to be viewed, however, in the context of the above-average flexibility of labor and goods markets in the Baltics, which provides an alternative adjustment mechanism. Moreover, as these countries have amply demonstrated thus far, they are able to cope with the strictures implied by hard pegs—joining the Eurozone would bring the efficiency benefits of a common currency.

7. Estonia and Lithuania choose to enter with their currency board intact, and consequently they have maintained their exchange rate relative to the euro within a much smaller band than required.

Chapter 15 Conclusions

May 1975, p. 21.

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