

**CURRENCY BOARDS
FOR DEVELOPING COUNTRIES:
A HANDBOOK
(REVISED EDITION, 2015)**

by Steve H. Hanke and Kurt Schuler

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In the beginning God created sterling and the franc.

On the second day He created the currency board and, Lo, money was well managed.

On the third day God decided that man should have free will and so He created the budget deficit.

On the fourth day, however, God looked upon His work and was dissatisfied. It was not enough.

So, on the fifth day God created the central bank to validate the sins of man.

On the sixth day God completed His work by creating man and giving him dominion over all God's creatures.

Then, while God rested on the seventh day, man created inflation and the balance-of-payments problem.

—Peter B. Kenen (1978: 13)

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PREFACE TO THE REVISED EDITION

The International Center for Economic Growth, through its offshoot ICS Press, published the original version of this study in 1994. With their permission, we posted a slightly updated version on the Internet in 2000. We thank them again in connection with this edition, which updates a few references to events but is not a comprehensive revision. We are working on a big book about currency boards with Nicholas Krus that will summarize our quarter-century or more of thinking on the subject.

The study has had substantial influence. It has been translated into Bulgarian, French, Spanish, Turkish, and Georgian. A modified version, adapted to the specific circumstances of Lithuania, influenced that country's monetary reform of 1994 (Hanke and Schuler 1994b). Both an unauthorized and an authorized Bulgarian translation were widely read during the high inflation that preceded Bulgaria's adoption of currency board-like rules in 1997 (Hanke and Schuler 1996, 1997). Recently, there have been expressions of interest in an Arabic translation.

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ABOUT THE AUTHORS (2015)

Steve H. Hanke (Email: hanke@jhu.edu, Twitter: @Steve_Hanke) is Professor of Applied Economics and Co-Director of the Institute for Applied Economics, Global Health, and the Study of Business Enterprise at The Johns Hopkins University in Baltimore. He is a Senior Fellow and Director of the [Troubled Currencies Project](#) at the Cato Institute in Washington, D.C.; a Senior Advisor at the Renmin University of China's International Monetary Research Institute in Beijing; a Special Counselor to the Center for Financial Stability in New York; and a contributing editor at *Globe Asia Magazine*. Prof. Hanke is also a member of the Charter Council of the Society of Economic Measurement and the Financial Advisory Council of the United Arab Emirates.

In the past, Prof. Hanke taught economics at the Colorado School of Mines and the University of California, Berkeley. He served as a Member of the Governor's Council of Economic Advisers in Maryland in 1976-77; as a Senior Economist on President Reagan's Council of Economic Advisers in 1981-82; and as a Senior Advisor to the Joint Economic Committee of the U.S. Congress in 1984-88. Prof. Hanke also served as a State Counselor to both the Republic of Lithuania in 1994-96 and the Republic of Montenegro in 1999-2003. He was also an advisor to the presidents of Bulgaria in 1997-2002, Venezuela in 1995-96, and Indonesia in 1998. He played an important role in establishing new currency regimes in Argentina, Estonia, Bulgaria, Bosnia-Herzegovina, Ecuador, Lithuania, and Montenegro. Prof. Hanke has also advised the governments of many other countries, including Albania, Kazakhstan, and Yugoslavia.

Prof. Hanke is a Distinguished Associate of the International Atlantic Economic Society; a Distinguished Professor at the Universitas Pelita Harapan in Jakarta, Indonesia; and a Professor Asociado (the highest honor awarded to international experts of acknowledged competence) at the Universidad del Azuay in Cuenca, Ecuador. He has been awarded honorary doctorate degrees by the Bulgarian Academy of Sciences, the Universidad San Francisco de Quito, the Free University of Tbilisi, Istanbul Kültür University, and Varna Free University in honor of his scholarship on exchange-rate regimes. In 1998, he was named one of the twenty-five most influential people in the world by *World Trade Magazine*.

Prof. Hanke is a well-known currency and commodity trader. Currently, he serves as Chairman of Hanke-Guttridge Capital Management, LLC — an investment manager located in Maryland that employs a long-short equity strategy. He is also a member of the Supervisory Board of Advanced Metallurgical Group N.V., in Amsterdam, and Chairman Emeritus of the Friedberg Mercantile Group, Inc. in Toronto. During the 1990s, he served as President of Toronto Trust Argentina in Buenos Aires, the world's best-performing emerging market mutual fund in 1995.

Prof. Hanke's most recent books are *Zimbabwe: Hyperinflation to Growth* (2008) and *A Blueprint for a Safe, Sound Georgian Lari* (2010).

Prof. Hanke and his wife, Liliane, reside in Baltimore and Paris.

Kurt Schuler is an economist in the Office of International Affairs at the U.S. Department of the Treasury. (This book was written while he was a post-doctoral fellow at The Johns Hopkins University, long before he began working at the Treasury, and does not necessarily reflect the Treasury's views.) In his spare time he is a Senior Fellow in Financial History at the Center for Financial Stability in New York, where he founded and edits the Historical Financial Statistics database. Previously he worked as a senior

economist at the Joint Economic Committee of the U.S. Congress and as a consultant on monetary matters in a number of countries. His most recent book is *The Bretton Woods Transcripts*, edited with Andrew Rosenberg, which won the 2014 Best Scholarly Edition award from the European Society for the History of Economic Thought.

1. THE CASE FOR CURRENCY BOARDS

Since the final breakup of the Bretton Woods monetary system in 1973, the gap that once existed between the currencies of developed and developing countries has widened into a gulf. During the Bretton Woods system and the "classical," pre-1914 gold standard, and to a lesser extent also between the world wars, developing countries and developed countries alike generally had sound currencies. A sound currency is one that is stable, credible, and fully convertible. Stability means that current annual inflation is relatively low, usually in single digits. Credibility means that the issuer creates confidence that it will keep future inflation low. Full convertibility means that the currency can buy domestic and foreign goods and services, including buying foreign currencies at market rates without restriction.

Today, most developed countries still have currencies that are sound, if not as stable as under the gold standard. Most developing countries, in contrast, have unsound currencies (Schuler 1996).¹ The loss of sound currencies is connected to the rise of central banking in developing countries. During most of the period before the final breakup of the Bretton Woods system, most developing countries did not have modern-style central banks. Instead, they had competitive issue of notes by privately owned commercial banks (in Latin America, East Asia, and self-governing British colonies), monopoly issue of notes by a privately owned commercial bank (in the colonies of European powers other than Britain) or currency boards (in most non-self-governing British colonies and some independent nations) (Conant 1969 [1927], Schuler 1992a, b). Central banking is a recent arrival in most developing countries. It did not become widespread in Latin America until the 1920s, and did not become widespread in Africa, the Middle East, and Southeast Asia until the 1950s. Typically, within a decade of establishing a central bank, developing countries experienced higher inflation and more restricted convertibility than previously.

The high inflation and limited convertibility characteristic of unsound currencies have hindered the economic development of developing countries. Unsound currencies discourage domestic and foreign investment alike. A number of developing countries that had net inflows of capital under colonial rule and during the first years of independence, when they had sound currencies, became net exporters of capital after their currencies became unsound, as foreign capital dried up and domestic capital illegally fled to avoid confiscation by means of inflation. Consequently, economic development slowed, stagnated, and in some cases even reversed. Historical experience suggests that to attract renewed capital investment and encourage renewed economic development, developing countries need sound currencies. As we will discuss in more detail later, historical experience also suggests that central banking has little likelihood of providing sound currencies soon in most developing countries.

Of rival systems to central banking, the currency board system was especially widespread: it has existed in more than 70 countries. Currency board systems continue to exist in some countries, most notably Hong Kong. In the 1990s several countries also established currency board-like systems having some but not all features of orthodox currency boards. This study explains the potential broader applicability of the currency board system for providing sound currencies in developing countries that now lack them.

¹ Since we wrote this study in 1994, the average performance of currencies in developing countries has improved substantially. It has remained the case, though, that the most troubled currencies have been those of developing countries.

Currency board versus central bank

Central banking is familiar to most people, at least on a practical level, as the monetary system of their country. A central bank is a monetary authority that has discretionary monopoly control of the supply of the reserves of commercial banks. Usually this implies a monopoly of the supply of notes (paper currency) and coins.² Discretionary control means the ability to choose a monetary policy at will, at least partly unconstrained by rules. Reserves mean the medium used to settle payments. Often, a monetary system uses two types of media to settle payments: one type that is used primarily domestically, such as notes issued by the monetary authority, and foreign reserves (ultimate reserves) used in international trade, such as gold, foreign bonds, or notes issued by a foreign central bank. Commercial banks, in the broad sense that we will use the term, are all banks other than the central bank, including cooperative banks, investment banks, and savings banks.

Though the currency board system has enjoyed a revival of interest, it remains imperfectly known to many people. A currency board is a monetary institution that issues notes and coins (and, in some cases, deposits) fully backed by a foreign "reserve" currency and fully convertible into the reserve currency at a fixed rate and on demand. The reserve currency is a convertible foreign currency or a commodity chosen for its expected stability. The country that issues the reserve currency is called the reserve country. (If the reserve currency is a commodity, the country that has the currency board is itself considered the reserve country.)

As reserves, a currency board holds low-risk, interest-earning securities and other assets payable in the reserve currency. A currency board holds reserves equal to 100 per cent or slightly more of its notes and coins in circulation, as set by law. The simplest type of currency board accepts no deposits and issues no securities; if a currency board does accept deposits or issue securities, they too must be backed 100 per cent or slightly more by assets payable in the reserve currency. A currency board earns profits from the difference between the return on the reserve-currency securities it holds and the expense of maintaining its notes and coins in circulation. It remits to the government (or to its owner, if not the government) profits beyond what it needs to pay its expenses and to maintain its reserves at the level set by law. A currency board does not have discretionary control of the quantity of notes, coins, and deposits it supplies. Market forces determine the quantity of notes, coins, and deposits it supplies, and hence the overall money supply in a currency board system.

A currency board is only a part of the monetary system in any country that has commercial banks and other financial institutions. The currency board *system* comprises the currency board, commercial banks, and other financial institutions. It also comprises certain rules of behavior by them and the government concerning exchange rates, convertibility, government finance, and so on.

Table 1.1 lists differences between a typical currency board and a typical central bank. This section briefly explains each difference. Later chapters discuss the differences in detail. We emphasize that the descriptions are accurate for typical actual currency boards and central banks, past and present. The

² In some countries, a government agency other than the central bank issues coins. Coins are typically a very small proportion of the total money supply, and the agency issuing coins usually coordinates its policy with that of the central bank, so it typically has no independent influence on monetary policy.

description of a currency board does not describe a theoretically ideal currency board, nor does it describe an exceptionally good actual currency board. It describes atypical actual currency board, although the actual performance of currency boards has been close to the ideal they have been established to strive for (see chapter 3). Similarly, the description of a central bank does not describe a theoretically ideal central bank. Nor does it describe an exceptionally good actual central bank such as the U.S. Federal Reserve System or the Monetary Authority of Singapore. It describes a typical actual central bank. The description fits most central banks, especially those in developing countries, which are a substantial majority of central banks in existence today.

Figure 1.1. A typical currency board versus a typical central bank

Typical currency board	Typical central bank
Usually supplies notes and coins only	Supplies notes, coins, and deposits
Fixed exchange rate with reserve currency	Pegged or floating exchange rate
Foreign reserves of 100 per cent	Variable foreign reserves
Full convertibility	Limited convertibility
Rule-bound monetary policy	Discretionary monetary policy
Not a lender of last resort	Lender of last resort
Does not regulate commercial banks	Often regulates commercial banks
Transparent	Opaque
Protected from political pressure	Politicized
High credibility	Low credibility
Earns seigniorage only from interest	Earns seigniorage from interest and inflation
Cannot create inflation	Can create inflation
Cannot finance spending by domestic government	Can finance spending by domestic government
Requires no "preconditions" for monetary	Requires "preconditions" for monetary reform
Rapid monetary reform	Slow monetary reform
Small staff	Large staff

Note: The characteristics listed are those of a typical actual currency board or central bank, especially one in a developing country, not those of a theoretically ideal or exceptionally good currency board or central bank.

To begin at the top of the list in Table 1.1, a typical currency board *usually supplies notes and coins only*, whereas a typical central bank also supplies deposits. Some past currency boards have accepted deposits; today, the Hong Kong Monetary Authority and some currency board-like monetary authorities issue securities. The deposits of a typical currency board are subject to the same foreign reserve requirement as its notes and coins. To simplify exposition of the currency board system, this study usually discusses currency boards as if they issue notes and coins only. The additional complications that result from deposits and securities are minor and do not significantly change the analysis if they are interchangeable for their holders and subject to a uniform foreign reserve requirement for the currency board.

Notes and coins issued by the currency board or central bank and deposits of commercial banks at the currency board or central bank constitute the monetary base. The monetary base counts as reserves when held by commercial banks, but not when held by the public. Deposits of the public at commercial banks and notes and coins held by the public constitute the money supply.³ Notes and coins in circulation, whether held by the public or by commercial banks, constitute cash.

Deposits at the central bank are the main form of reserves for commercial banks in a typical central banking system. In a typical currency board system, commercial banks hold no deposits at the currency board; instead, reserve-currency assets are their main form of reserves. In a currency board system and a central banking system alike, commercial banks hold "vault cash"--notes and coins of the currency board or central bank--to satisfy their depositors' requests to convert deposits into notes and coins.

A typical currency board maintains a truly *fixed exchange rate with the reserve currency*. The exchange rate is permanent, or at most can be altered only in emergencies. The exchange rate may be written into the constitution that describes the legal obligations of the currency board. The record of currency boards in maintaining fixed exchange rates has been excellent (see chapter 3). A typical central bank, in contrast, maintains a pegged or floating exchange rate rather than a truly fixed rate. A pegged exchange rate is constant for the time being in terms of a reserve currency, but carries no credible long-term guarantee of remaining at its current rate. A floating exchange rate is not maintained constant in terms of any reserve currency. The exchange rate maintained by a central bank is typically not written into law, and can be altered at the will of the central bank or the government. When a typical central bank suffers heavy political or speculative pressure to devalue the currency, it devalues. As we shall see later, allegedly fixed exchange rates maintained by central banks have in reality typically been pegged exchange rates.

As reserve assets against its liabilities (its notes and coins in circulation), a typical currency board holds securities in the reserve currency; it may also hold bank deposits and a small amount of notes in the reserve currency. It holds *foreign reserves of 100 per cent* or slightly more of its note, coin, and deposit liabilities, as set by law. Many currency boards have held a maximum of 105 or 110 per cent foreign reserves to have a margin of protection in case the reserve-currency securities they held lost value. A typical central bank, in contrast, has variable foreign reserves: it is not required to maintain any fixed, binding ratio of foreign reserves to liabilities. Even where a minimum ratio exists, a typical central bank can hold any ratio in excess of that. For example, a central bank required to hold at least 20 per cent foreign reserves may hold 30, 130, or even 330 per cent foreign reserves. A typical central bank also holds domestic-currency assets, which a typical currency board does not.

A typical currency board has *full convertibility* of its currency: it exchanges its notes and coins for reserve currency at its stated fixed exchange rate without limit. Anybody who has reserve currency can exchange it for currency board notes and coins at the fixed rate, and anybody who has currency board notes and coins can exchange them for reserve currency at the fixed rate. However, a currency board does not guarantee that deposits at commercial banks are convertible into currency board notes and

³ We make this definition of the money supply for ease of exposition. In practice, near-monies such as accounts at money market mutual funds may be almost as liquid and widely accepted in payment as deposits at commercial banks. To avoid such problems of definition, one can think of commercial banks as symbolizing all institutions that extend credit widely accepted as means of payment.

coins. Commercial banks are responsible for holding enough notes and coins as vault cash to satisfy their contractual obligations to their depositors to convert deposits into notes and coins on demand. If the government imposes no minimum reserve requirement on commercial banks, commercial banks may hold any quantity (or ratio of reserves to liabilities) that they think is prudent; they are not required to hold 100 per cent foreign reserves like the currency board, nor 100 per cent currency board notes and coins against deposits. (In other words, M0 is backed 100 per cent by foreign reserves in a currency board system, but broader measures of the money supply such as M1, M2, and M3 are not.) Deposits at commercial banks denominated in the currency board currency are fully convertible at a fixed exchange rate into currency board notes and coins, and currency board notes and coins are fully convertible at a fixed exchange rate into the reserve currency. As for foreign currencies other than the reserve currency, the currency board has no direct role in determining exchange rates with them. Commercial banks trade them at market-determined exchange rates, which may be fixed, pegged, or floating against the reserve currency and hence against the currency board currency.

A typical central bank, in contrast, has limited convertibility of its currency. Central banks in almost all developed countries and in some developing countries have fully convertible currencies, but most central banks in developing countries have partly convertible or inconvertible currencies. They restrict or forbid certain transactions, particularly purchases of foreign securities or real estate (see the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions).

A typical currency board has a *rule-bound monetary policy*. A currency board is not allowed to alter the exchange rate, except perhaps in emergencies. (Chapter 5 proposes rules for defining such emergencies.) Nor is a currency board allowed to alter its reserve ratio or the regulations affecting commercial banks. A currency board merely exchanges its notes and coins for reserve currency at a fixed rate in such quantities as commercial banks and the public demand. When the demand for money changes, the role of a currency board is passive. Market forces alone determine the money supply through a self-adjusting process described in chapter 3.

A typical central bank, in contrast, has a partly or completely discretionary monetary policy. A central bank can alter at will, or with the approval of the government, the exchange rate, its ratio of foreign reserves, or the regulations affecting commercial banks. It is not subject to strict rules like a typical currency board.

A typical currency board is *not a lender of last resort*, that is, it does not lend to commercial banks or other firms to help them avoid bankruptcy. Commercial banks in a currency board system must rely on alternatives to a lender of last resort (see chapter 6). A typical central bank, in contrast, is a lender of last resort.

A typical currency board does *not regulate commercial banks*. Banking regulations in a currency board system are usually few, and are enforced by the ministry of finance or an office of bank regulation. A typical central bank, in contrast, often regulates commercial banks. Perhaps the most common form of regulation is imposing reserve requirements on commercial banks. The required reserves, which are held in the form of deposits at the central bank and vault cash, typically exceed the prudential reserves that commercial banks would hold if no reserve requirements existed.

The activities of a typical currency board are *transparent*, because a currency board is a very simple institution. It is merely a sort of warehouse for reserve-currency securities that back its notes and coins in circulation. The activities of a typical central bank are opaque. A central bank is not a warehouse; it is a speculating institution whose effectiveness partly depends on the ability to act secretly sometimes.⁴

Because a typical currency board is rule-bound and transparent, it is *protected from political pressure*. It is protected by implicit rules of political behavior, or, better yet, by an explicit constitution such as that of the Appendix. A typical central bank is politicized. Some central banks, such as the U.S. Federal Reserve System and the European Central Bank, are politically independent in the sense that their governors, once appointed, have sole control of the monetary base and cannot be fired by the executive branch of the government or the legislature during their fixed terms of office, and that the executive branch or legislature cannot dictate lending by the central bank. Even the most politically independent central banks sometimes yield to strong political pressure. Even the most politically independent central banks sometimes yield to strong political pressure, though.

A typical currency board has *high credibility*. Its 100 per cent foreign reserve requirement, rule-bound monetary policy, transparency, and protection from political pressure enable it to maintain full convertibility and a fixed exchange rate with the reserve currency. An appropriately chosen reserve currency will be stable; therefore, the currency issued by the currency board will be stable. A typical central bank, in contrast, has low credibility. A few exceptionally good central banks, which exist mainly in developed countries, have high credibility, but the majority do not. Because a typical central bank has discretion in monetary policy, is opaque, and is politicized, it has the means and the incentive to break promises about the exchange rate or inflation whenever it wishes.

Readers may ask how credible a typical currency board can be if, as has been the case with most currency boards, its reserve currency is issued by a central bank. Might not the central bank of the reserve country create monetary instability in a country with a currency board, for example? No central bank has a perfect record of combating inflation. The central bank of the reserve country may export instability and inflation to the currency board country through the currency board.

We reply that one must think in terms of relative credibility. The reserve currency, if a currency issued by a central bank rather than a commodity, should be issued by an exceptionally good central bank, such as the U.S. Federal Reserve System, European Central Bank,⁵ or Bank of Japan. Those three central banks

⁴ Even the most respected central banks have hidden their activities from public inspection. For example, the economist Oskar Morgenstern (1963: 20-1), who researched the accuracy of central bank balance sheets, remarked that Central banks in many countries, the venerable Bank of England not excepted, have for decades published deliberately misleading statistics, as, for example, when part of the gold in their possession is put under "other assets" and only part is shown as "gold." In democratic Great Britain before World War II, the Government's "Exchange Equalization Account" suppressed for a considerable period all statistics about its gold holdings, although it became clear later that these exceeded the amount of gold shown to be held by the Bank of England at the time. This list could be greatly lengthened. If respectable governments falsify information for policy purposes, if the Bank of England lies and hides or falsifies data, then how can one expect minor operators in the financial world always to be truthful, especially when they know that the Bank of England and so many other central banks are not?

⁵ When we first wrote this passage in 1994, it mentioned the German Bundesbank. We revised it in 2000 to reflect that the European Central Bank had begun issuing the euro in 1999. The euro has proved durable despite stresses.

are not perfect, but they have much more credibility than most other central banks now have or will have in the foreseeable future. The U.S. dollar, the euro, and the Japanese yen have exceptionally good records and good prospects for future stability, whereas most currencies issued by other central banks have bad records and bad prospects for future stability. For example, among developing countries with more than 1 million people, 90 percent had their currencies depreciate against the dollar from 1970 to 1993 (Schuler 1996: 33). A currency board transmits the relative credibility of the reserve country's central bank to the currency board country, whereas no such effect occurs if the country continues with a typical central bank. A currency board can "import" the monetary policy of an exceptionally good central bank by means of a fixed exchange rate to the currency issued by that central bank.

A typical currency board *earns seigniorage (income from issue) only from interest*. The currency board earns interest from its holdings of reserve-currency securities (its main assets), yet pays no interest on its notes and coins (its liabilities). Gross seigniorage is the income from issuing notes and coins. It can be explicit interest income or implicit income in the form of goods acquired by spending money. Net seigniorage (profit) is gross seigniorage minus the cost of putting and maintaining notes and coins in circulation.

A typical central bank also earns interest on its holdings of securities, which include domestic as well as foreign securities. It earns seigniorage on its notes and coins in circulation and on the deposits that commercial banks hold with it. The deposits, like notes and coins, usually pay no interest. But a more important source of seigniorage for a typical central bank is inflation. To define inflation precisely, it is a general increase in nominal prices, typically caused by an increase in the nominal money supply that is not the result of increased voluntary saving. A typical currency board cannot create inflation because it does not control the ultimate reserves of the monetary system. For instance, the currency board system of Hong Kong uses the U.S. dollar as its reserve currency. The ultimate reserves of the Hong Kong currency board system are the U.S. dollar monetary base, which is supplied by the U.S. Federal Reserve System rather than by the Hong Kong Monetary Authority. Like any system of fixed exchange rates, a currency board system may transmit inflation from the reserve country, but a currency board *cannot create inflation* because it cannot increase the monetary base independently of the monetary authority of the reserve country. A typical central bank, in contrast, can create inflation at its discretion by increasing the domestic monetary base.

A typical currency board *cannot finance spending by the domestic government* or domestic state enterprises because it is not allowed to lend to them. A typical central bank finances spending by the domestic government, whether to a relatively small extent (as in the United States) or to a large extent (as in many developing countries today).

A typical currency board *requires no "preconditions" for monetary reform*. Contrary to claims that have been made by studies from the International Monetary Fund (Baliño, Enoch and others 1997: 18; Enoch and Gulde 1997: 26-7), government finances, state enterprises, or trade need not be already reformed before the currency board can begin to issue a sound currency (Hanke 1999). A typical central bank cannot issue a sound currency unless the "fiscal precondition" exists, that is, the government no longer needs to finance budget deficits by means of inflation. Once governments start to depend on central banks for financing deficits, they usually have trouble stopping.

A typical currency board is conducive to *rapid monetary reform*. It can be established quickly and fulfill its purpose quickly. A typical central bank is a hindrance to rapid monetary reform.

Finally, a typical currency board needs only a *small staff* of a few persons who perform routine functions that are easily learned. A typical central bank needs a large staff trained in the intricacies of monetary theory and policy. The People's Bank of China employs 150,000 people; the Central Bank of the Russian Federation, more than 90,000; and the German Bundesbank and the Bank of France about 16,000 each (Hanke 2000a).

Currency boards versus dollarization, multinational central banks, and free banking

When the original edition of this study appeared in 1994, currency boards were the only method being widely discussed for unifying monetary policy in developing countries with the generally much better monetary policy of the countries issuing the major international currencies. Since 1999, dollarization and multinational central banks have also received attention as methods of unifying monetary policy. Another monetary system, free banking, has enjoyed a revival of academic interest even though it does not exist anywhere today.

Dollarization occurs when residents of a country extensively use the U.S. dollar or another foreign currency alongside or instead of the domestic currency. Unofficial dollarization occurs when individuals hold foreign-currency bank deposits or notes (paper money) to protect against high inflation in the domestic currency. Unofficial dollarization has existed in many countries for years. Dollarization has been in the news recently because of interest in official dollarization, which occurs when a government adopts foreign currency as the predominant or exclusive legal tender. For many years the largest economy to be officially dollarized was Panama, which has used the U.S. dollar officially since 1904. In early 1999 the government of Argentina stated that it sought a formal agreement with the United States to become officially dollarized.⁶ Argentina or any other country can become officially dollarized even without a formal agreement, but there may be economic and political benefits to a formal agreement. Argentina's action sparked discussion of official dollarization in other Latin American countries. On January 9, 2000, Ecuador dollarized to climb out of accelerating inflation, a banking crisis, and a deep recession.⁷ As of 2014 dollarization is nearing its 15-year anniversary, the longest period of monetary stability that Ecuador has enjoyed since the 19th century. Other countries that dollarized around the time of Ecuador were Kosovo (1999, initially using the German mark and switching to the euro when the euro fully replaced the mark in 2002), East Timor (2000), El Salvador (2001), and Montenegro (1999), using the German mark and later the euro, like Kosovo).⁸ The main difference between dollarization and an orthodox currency board is that under dollarization no distinct national currency exists. Unless arrangements can be made with the country whose currency it uses, a dollarized country loses the seigniorage it would earn with a currency board. Dollarization also deprives a country of whatever political benefits exist from having a distinct national currency. On the other hand, if the practical choice is not between an orthodox currency board and dollarization, but between a currency board-like system and dollarization, dollarization is likely to be more transparent, credible, and beneficial for the economy

⁶ On the evolution of dollarization in Argentina, see Hanke 1999b, Hanke 2003a, and Hanke and Schuler 1999.

⁷ For an account of the events that led up to Ecuador's dollarization, see Hanke 2003b, and Santos 2014.

⁸ Hanke was involved in the design and implementation of the dollarization in Ecuador, as an advisor to the Minister of Economy and Finance, and Montenegro as a State Counselor and Advisor to the President.

because it is harder to change. The greater transparency and credibility of dollarization influenced Ecuador to dollarize rather than establish the Argentine-style currency board-like system that it also considered.

The establishment of the European Central Bank to issue the euro in 1999 spurred interest among Eastern European and Balkan countries in the possibility of joining the European Central Bank as a method of unifying their monetary policy with that of the European Central Bank as a method of unifying their monetary policy with that of the euro zone. The European Central Bank is one of four multinational central banks today. The others are the Banque Centrale des Etats de l'Afrique de l'Ouest (Bank of West African States) and the Banque des Etats de l'Afrique Centrale (Bank of Central African States), which issue the CFA franc in a total of 14 countries, mainly former French colonies; and the Eastern Caribbean Central Bank, which issues the East Caribbean dollar in six former and two current British colonies.⁹ The Eastern Caribbean Central Bank originated as a multinational currency board. With a multinational central bank, the exchange rate is pegged (as with the central banks issuing the CFA franc and the Eastern Caribbean Central Bank) or floating (as with the European Central Bank) rather than fixed as is the case with a currency board. Exchange controls may exist, as they do for all current multinational central banks except the European Central Bank.

Free banking is a system of competitive issue of notes and other liabilities with minimal regulation. In particular, a completely free banking system has no central bank, no lender of last resort, no reserve requirements, and no legal restrictions on bank portfolios, interest rates, or branching. Free banking systems have existed in nearly 60 countries in the 1800s and early 1900s. In general, they were relatively stable and successful in preserving the fixed exchange rates to gold or silver that almost all maintained (Dowd 1992). Currency boards or central banks replaced free banking systems because of intellectual and political trends toward monopolizing issue of notes and coins in a government body, and no free banking systems exist today. In the last 25 years, however, interest in free banking among economists has revived because of dissatisfaction with the performance of central banks and, recently, the possibility that electronic money will make notes and coins obsolete, enabling banks to offer full-fledged rivals to government-issued currencies (Selgin and White 1994, Rahn 1999). Like a currency board, free banking typically involves a fixed exchange rate and no exchange controls. But rather than being determined by the reserve country, monetary policy is determined by competition among banks. Banks are at liberty to offer consumers any type of currency. The exchange rate can be fixed, pegged, or floating. If fixed or pegged, the anchor currency can be a commodity or a foreign currency. The preferences of consumers decide what kind of currency circulates and therefore what kind of monetary policy succeeds in competition. Also, unlike the case under a currency board, under free banking net seigniorage, like other forms of profit, tends to be competed away to zero and passed along to consumers. Because free banks have no monopoly of issuing notes and coins, they tend to issue them

⁹ As of 2015, the members of the European Central Bank are Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, the Slovak Republic, Slovenia, and Spain. The members of the Banque Centrale des Etats de l'Afrique de l'Ouest (Central Bank of West African States) are Benin, Burkina Faso, Côte d'Ivoire (Ivory Coast), Guinea-Bissau, Mali, Niger, Senegal, and Togo. The members of the Banque des Etats de l'Afrique Centrale (Bank of Central African States) are Cameroon, Central African Republic, Chad, Republic of Congo (Congo-Brazzaville), Equatorial Guinea, and Gabon. The members of the Eastern Caribbean Central Bank are Anguilla, Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. Anguilla and Montserrat, which are British colonies, are the only members of any multinational central bank that are not independent.

up to the point where the profit is zero. This does not mean that free banking is inherently inflationary; the commitment to a fixed exchange rate that almost all free banking systems have had tends to prevent inflation.

Free banking ideas in modified form have gained a fresh wind from the rise of “cryptocurrencies,” of which Bitcoin is the most widely used and studied. It would take us too far afield to delve into cryptocurrencies here, but readers interested in the subject may begin with Dourado and Brito (2014).

Currency boards and wider economic reforms

Until the revival of interest in currency boards, almost all economists simply assumed that most countries should have central banks. Preventing central banks from misbehaving has been a key problem in economic reform packages such as those implemented in Latin America in the 1980s and former communist countries in the 1990s. A currency board can be part of an alternative approach to economic stabilization that enables the goals of reform to be achieved more effectively than is usually the case with a central bank.

The alternative approach achieves stabilization by means of deregulation of prices and trade and by means of a currency board with a fixed exchange rate. The conventional approach tries to achieve stabilization by means of liberalization of prices and trade, and by means of a central bank with a pegged exchange rate. The means appear similar, but have quite different effects.

The alternative approach advocates deregulation of prices and trade. It permits the government to abolish price controls as quickly as is politically feasible. The conventional approach advocates liberalization rather than deregulation of prices and trade. It abolishes many price controls, trade quotas, and tariffs, but retains others. In the conventional approach, full deregulation of prices and trade is not possible because the central bank allows the government and state enterprises to operate with soft budget constraints. Soft budget constraints mean that because economic agents receive subsidies, they can spend more than the sum of their earnings and their unsubsidized borrowing.

In the alternative approach, the means for imposing the hard budget constraints essential to macroeconomic stabilization is a currency board with a fixed exchange rate. A typical currency board tends to end soft budget constraints and impose their opposite, hard budget constraints, because it cannot create inflation to finance the government budget deficit. A currency board does not lend to the domestic government or to domestic state enterprises, whether directly, or through domestic commercial banks, or through the government budget. The hard budget constraint that a currency board tends to impose on the government limits the nominal and real amount of subsidies that the government can grant to state enterprises. That creates pressure on the government to restructure or close unprofitable state enterprises. Restructuring or closing state enterprises hardens their budget constraints. In the alternative approach, centralized price controls are unnecessary, from a strictly economic standpoint. The determination of prices can be left to market forces within the framework of hard budget constraints, because state enterprises that are unprofitable will tend to be closed or restructured by the government.

In the conventional approach, in contrast, the means for trying to impose hard budget constraints is a central bank whose currency is subject to devaluation. (In many countries, the president or cabinet

rather than the central bank has legal authority over exchange-rate decisions.) Devaluation softens budget constraints by allowing the central bank to continue to finance the government budget deficit with no ultimate nominal limit. When lending by the central bank increases the monetary base so much that the central bank loses large amounts of foreign reserves at the existing pegged exchange rate, the central bank can devalue the currency, re-pegging at a new rate that holds until it devalues.

Both the alternative approach and the conventional approach agree that microeconomic restructuring can begin before macroeconomic stabilization, but differ concerning the relationship between microeconomic restructuring and macroeconomic stabilization. The alternative approach tends to impose hard budget constraints rapidly. In the alternative approach, the government tends to finance itself by levying taxes and by borrowing at positive real interest rates. It may continue to subsidize some state enterprises, so that their budget constraints remain soft, but it is forced to choose which unprofitable state enterprises it will continue to subsidize and tends to harden the budget constraints of the rest by restructuring or closing them. State commercial banks tend to increase interest rates to positive real levels and cease being conduits for subsidies to state enterprises, because in the alternative approach no central bank exists as a lender of last resort to subsidize state commercial banks or state enterprises. Commercial banks tend to become monitors of the performance of enterprises, which in turn tends to make enterprises more market-oriented, for example by limited wage increases to levels justified by the productivity of workers.

The alternative approach has no preconditions, fiscal or otherwise; rather, by tending to impose hard budget constraints, it solves the fiscal preconditions for economic reform and simultaneously introduces a sound currency immediately. It tends to achieve macroeconomic stability more rapidly and allows other economic reforms to proceed sooner than in the conventional approach. The experience of the recent currency boardlike systems and of some orthodox currency board systems that implemented economic reforms after the Second World War indicate that the alternative approach can be successful. The conventional approach, in contrast, often fails to harden budget constraints rapidly because it relies on a central bank. As a result, nagging inflation prevents it from achieving its full economic potential.

Most countries experiencing economic problems need reforms in addition to monetary stabilization. The details of a good package of economic reforms differ widely across time and space, but the need to keep inflation low and impose hard budget constraints is a recurrent theme. A currency board is not a panacea, and the main advocates of currency boards have never claimed that it is. By tending to impose hard budget constraints, however, a currency board creates pressure for other economic reforms and increases the prospect that they will be successful. In economic policy there are rarely any certainties; rather, there are higher and lower chances for success. A typical currency board provides higher chances for success than a typical central bank.

Outline of this study

This study explains how a currency board system works and how to establish a currency board. Chapter 2 states general theoretical and practical arguments against using a typical central bank as a means of trying to provide a sound currency.

Chapter 3 explains how the money supply is determined in a currency board system, and contrasts it with how the money supply is determined in a central banking system.

Chapter 4 describes two approaches to establishing a currency board. One approach is to convert the central bank into a currency board. The other approach is to establish the currency board as the issuer of a parallel currency to the central bank currency. (A parallel currency is one that circulates extensively alongside another currency. The parallel currency can have a fixed, pegged, or floating exchange rate with the other currency, and can circulate legally or illegally.¹⁰ If the currency board is the issuer of a parallel currency, its currency will circulate officially alongside the central bank currency at the market rate of exchange, much as foreign currency now does unofficially in many countries.

A currency board issues notes and coins backed 100 per cent by foreign reserves in a reserve currency such as the U.S. dollar, the euro, or the Japanese yen. A currency board exchanges its currency for the reserve currency at a truly fixed exchange rate. The currency board can obtain its initial foreign reserves in several ways. Chapter 4 describes how to calculate the appropriate size of the initial foreign reserves of the currency board and how to obtain the initial foreign reserves.

Chapter 5 explains how to operate a currency board. It also contains ideas about ways to protect the currency board from political pressure, in particular from pressure to convert it into a central bank. Furthermore, it suggests how a currency board system can deal with a reserve currency that becomes unstable.

Chapter 6 responds to objections to the currency board system. Chapter 7 summarizes our proposals.

The Appendix contains a model constitution for a currency board.

¹⁰ Some economists reserve the term "parallel currency" for a currency that circulates alongside another at a floating exchange rate, often illegally.

2. THE CASE AGAINST TYPICAL CENTRAL BANKS

There are a number of general theoretical and practical arguments against using a typical central bank to provide a sound currency. By reviewing them carefully, we can untangle some confusions that have arisen because economists and politicians have assumed that a central bank is the only means by which to achieve macroeconomic stabilization. Many problems of stabilization that occur in a typical central banking system do not occur in a typical currency board system.

The functions of money

Consideration of the performance of a monetary system must begin with consideration of the functions of money. Money functions as a medium of exchange, store of value, and unit of account. A sound currency fulfills all three functions satisfactorily and enables participants in a market economy to make decentralized exchanges efficiently. Without a sound currency, decentralized exchange cannot reach its full potential. A currency that suffers high inflation reduces the efficiency of decentralized exchange and hence of a market economy.

Many currencies issued by central banks in developing countries are at present unsound, fulfilling none of the three functions of money satisfactorily. They are inadequate media of exchange: the outside world refuses to accept them. That impedes foreign investment and trade, and hence the growth of national economies. They are also avoided domestically in cases where people can illegally use sound foreign currencies easily.

Many currencies issued by central banks in developing countries are unreliable stores of value: high inflation makes their value unpredictable. As a result, people in countries with such currencies save by hoarding commodities or relatively stable foreign currencies, which retain value better than the domestic currency. Such hoarding is rational because of the rapid depreciation of domestic currencies, but costly compared to being able to use a sound domestic currency. Hoarding of commodities diverts goods from use by their ultimate consumers into the stockpiles of enterprises and middlemen. Hoarded bricks, for instance, could be used to build apartments instead of piling up at construction sites.

In many countries with unsound currencies, extensive holding of foreign currency notes is widespread. Researchers from the Federal Reserve System have estimated that 55 to 70 percent of U.S. dollar notes are held outside the United States (Porter and Judson 1996: 899). Acquiring foreign notes requires residents of developing countries to give up goods and services to obtain pieces of paper that central banks in developed countries print at almost no cost. It creates a perverse form of foreign aid that flows from countries with unsound currencies to countries with sound currencies, which are typically much wealthier. Besides holding foreign notes, enterprises and individual persons in countries with unsound currencies often hold bank deposits, securities, and real estate abroad, usually in violation of restrictions on convertibility. Foreign bank deposits earn interest, so unlike holding foreign notes they do not generate a perverse form of foreign aid, but they reduce the capital available domestically to help modernize the domestic economy. Many currencies issued by central banks in developing countries are unsatisfactory units of account: high inflation distorts the structure of prices and makes economic calculation very difficult. Real (inflation-adjusted) prices fluctuate widely because sellers have difficulty estimating the effect of inflation, not because of underlying real changes in supply and demand. The competitiveness of export products in world markets consequently experiences large fluctuations

caused entirely by inflation, making it difficult for domestic industries to plan production for export markets and to earn foreign currency.

Stability and credibility

To understand more precisely how sound domestic currencies would benefit the economies of countries that now lack them, let us consider the connection between each of the qualities of a sound currency enumerated in the previous chapter--full convertibility, credibility, and stability--and the corresponding functions of money--as a medium of exchange, a store of value, and a unit of account, respectively.

A currency's usefulness as a unit of account depends on its stability. Stability means that current annual inflation is relatively low, usually in single digits. We will combine discussion of stability with discussion of credibility. Credibility means that the issuer creates confidence that it will keep future inflation low. The concept of credibility in a sense compresses expectations of the future stability of the currency into the present. A currency's usefulness as a store of value depends on its credibility.

Central banks everywhere have difficulty achieving credibility. The difficulty is especially severe in developing countries, because central banks there experience very strong political pressure for inflation. For example, in the last 15 years Iceland and Israel are apparently the only developed countries that have had inflation over 20 percent in any single year, whereas more than 100 developing countries have had inflation that high.

Lack of credibility typically contributes to high inflation and high real interest rates. For example, workers base their demands for wages on the expectation that the central bank will depreciate the domestic currency. State enterprises and government ministries incur deficits because they expect that the government will rescue them by pressuring or passing laws ordering the central bank to finance the deficits. Such behavior creates momentum for continued inflation.

In a typical central banking system, high real interest rates often accompany high inflation. To compensate investors for perceived exchange risk--the risk of using a currency prone to devaluation--real interest rates for borrowers without access to subsidized credit typically must be high. High real interest rates stifle economic activity by increasing the cost of borrowing. Alternatively, real interest rates can be kept low by imposing controls on interest rates and convertibility, but then shortages of credit occur because demand exceeds supply at the controlled interest rates, which do not take into account the exchange risk. Where currencies are sound, real interest rates in truly unrestricted markets for credit are typically positive but low, which encourages savings yet avoid stifling economic growth.

In contrast to a typical central bank, a typical currency board has high credibility. A typical currency board system tends to have low inflation because its reserve currency has low inflation. Also, because a fixed exchange rate with the reserve currency prevents depreciation, a typical currency board system tends to have interest rates similar to the levels prevailing in the reserve currency, plus an allowance for

political risk (the risk that private property rights will not be enforced or that the government will seize private property), taxes, and transactions fees.¹¹ Exchange risk tends to be absent.

Credibility and exchange rates

The degree of credibility of a monetary system affects the type of exchange-rate arrangements that are sustainable for it. An exchange-rate arrangement that is not credible tends not to be sustainable because it imposes high costs on the economy.

Along the continuum of exchange-rates from most flexible to most rigid, there are three basic types. To reiterate, a pegged exchange rate is constant for the time being in terms of a reserve currency, but carries no credible long-term guarantee of remaining at its current rate. A pegged exchange rate should not be confused with a fixed exchange rate. A fixed exchange rate is permanent, or, if the monetary authority can alter it in emergencies, the monetary authority must follow well-defined rules known in advance by the public. A floating exchange rate is not maintained constant in terms of any reserve currency.¹²

The main difference between a fixed exchange rate and a pegged exchange rate is credibility. A typical central bank cannot maintain a truly fixed exchange rate because it has low credibility. A declaration by a typical central bank that it is maintaining a fixed exchange rate is not credible because the monetary rule of a fixed exchange rate conflicts with discretionary monetary policy. The only period when a large number of central banks have maintained truly fixed exchange rates was during the "classical" gold standard (1880 or before to 1914). At the time, central banks were still in the minority among the monetary systems of the world, and many central banks were owned privately rather than by governments (Conant 1969 [1927]). Those conditions, which induced central banks to maintain fixed exchange rates, no longer apply. Since 1914, almost all central banks that have claimed to maintain "fixed" exchange rates, including exceptionally good central banks, have in reality maintained pegged exchange rates. Almost all central banks devalued their currencies against gold or silver during the First World War, the Great Depression, the Second World War, and the breakup of the Bretton Woods system in the early 1970s. Most central banks with pegged exchange rates have also devalued their currencies individually at other times (for a history, see Yeager 1976: 295-610).

The main purpose of a pegged exchange rate is to make hard budget constraints more credible. A hard budget constraint means that an economic agent cannot spend more than it earns plus what it can borrow in unsubsidized credit markets. The opposite of a hard budget constraint is a soft budget constraint, where an economic agent receives subsidies and therefore can spend more than it earns and borrows in unsubsidized credit markets. In practice, though, pegged rates in developing countries are

¹¹ Very high real interest rates are usually caused by exchange risk or political risk. A currency board will tend to eliminate exchange risk with the reserve currency, but it will not eliminate political risk. Real interest rates will be high unless property rights are secure.

¹² Fixed, pegged, and floating exchange rates are easiest to distinguish when currencies are fully convertible. The differences among them become somewhat blurred for partly convertible or inconvertible currencies, because foreign-exchange controls often are more important than exchange-rate arrangements in influencing the true market exchange rates of the currencies. A currency that has a pegged exchange rate and capital controls may behave like a floating currency in unrestricted foreign-exchange markets, such as the black market.

typically sinking rates, involving devaluation or foreign-exchange controls to accommodate soft budget constraints. The bias toward devaluation creates perverse consequences. As compensation for the perceived risk of devaluation of a pegged exchange rate, lenders and investors demand higher real rates of interest than would exist with a truly fixed exchange rate (Walters 1990: 14-15). It may take years for a typical central bank to achieve substantial credibility for a pegged exchange rate. In the meantime, high real interest rates to defend a pegged exchange rate create high costs that are particularly painful to capital-intensive industries and to export industries that compete against foreign counterparts based in countries with more credible monetary authorities.

Alternatively, a central bank may keep real interest rates low by imposing interest rate controls and restricting convertibility, but that causes a shortage of credit. High real interest rates are one perverse consequence of pegged exchange rates; frequent high real exchange rates are another. The real exchange rate is the ratio of the prices of traded goods to the prices of nontraded goods. Traded goods are exports and imports. Nontraded goods are goods such as land and labor, which for various reasons cannot easily be moved from one country to another. There are several ways to calculate price ratios of traded to nontraded goods, but the important thing is that all are intended to show whether exchange rates are systematically affecting the competitiveness of export industries. Overvalued real exchange rates mean that export industries are relatively uncompetitive, whereas undervalued real exchange rates mean that export industries are relatively competitive.¹³

Overvalued real exchange rates in countries with pegged rates can result from sudden increases in foreign investment or, more commonly, from domestic inflation. A typical central bank maintaining a pegged exchange rate tends to inflate, which causes the monetary base to increase faster than its foreign reserves. Consequently, the domestic price level increases. Imports become less expensive and exports decrease because they become more expensive in world markets. The central bank loses foreign reserves as people buy more imports and as currency speculators bet that the loss of foreign reserves will induce the central bank to depreciate the currency. To avoid losing more foreign reserves and to revive exports, the central bank imposes foreign-exchange controls. Alternatively, the central bank devalues the currency, re-pegging it at an exchange rate sufficiently undervalued that for a while the central bank can safely continue to inflate. An undervalued exchange rate temporarily revives exports by making them suddenly inexpensive and chokes imports by making them suddenly expensive, but as inflation continues and the exchange rate later becomes overvalued, the opposite effects occur.

For an economy with a typical central bank maintaining a pegged exchange rate, therefore, a pegged rate alternately tends to depress and overstimulate economic activity. Export industries often experience high real interest rates and high costs for the nontraded goods that they use to help produce traded goods. Rather than increase their productivity to remain competitive, export industries often take the easier course of pressuring the central bank to devalue the currency. Political pressure to devalue the currency also comes from government ministries and state enterprises, who desire their soft budget constraints to continue. The incentives facing a typical central bank are such that it usually benefits more by devaluing the currency than by maintaining the existing exchange rate. The clash between the long-term goals and the short-term incentives of central banks is so pervasive that it has a name: "time consistency" (or

¹³ Several definitions of the real exchange rate exist; see Hutton (1992).

"time inconsistency"; see Kydland and Prescott 1977). The Southeast Asian currency crisis of 1997-8 is recent example of time inconsistency in central bank policy.

Even central banks that are better than average have had difficulty maintaining a "hard" peg, which allows no systematic depreciation. The difficulty of maintaining a hard peg has induced some central banks to experiment with a crawling peg.¹⁴ A crawling peg is a limited appreciation or depreciation of the currency according to a schedule. For example, a central bank may promise not to depreciate its currency against the U.S. dollar by more than 20 per cent a year. With a decelerating crawling peg, depreciation slows year by year and perhaps eventually stops. A decelerating crawl is implicitly a promise by the central bank to reduce the growth of the monetary base. A possible advantage of a crawling peg compared to a hard peg is that a crawling peg may be less costly to the economy because it does not try to achieve credibility immediately; instead, the crawl can decelerate to a hard peg when the central bank seems to have enough credibility to maintain a hard peg without high real interest rates or extensive foreign-exchange controls. Another way in which a crawling peg may be less costly to the economy than a hard peg is that if expectations of inflation pervade behavior and long-term contracts, a crawling peg reduces the shifts of real wealth that occur with a suddenly imposed hard peg.

The main disadvantage of a crawling peg is that it can accelerate, rather than decelerate to a hard peg. Countries that have tried crawling pegs have generally had higher inflation than other countries in their regions that have maintained harder pegs punctuated by occasional devaluations (Connolly 1985). A crawling peg does not change the governance or the incentives of the central bank, so it is little more credible than a hard peg. In addition, countries with very high inflation tend to have no long-term contracts in domestic currency because the domestic currency is not a reliable unit of account, so a sudden, credible end to inflation would not cause big shifts of real wealth from debtors to creditors. Consequently, a crawling peg has no significant advantage for a country with very high inflation (say, more than 100 per cent a year) compared to a hard peg. For a country with moderately high inflation (say, 20 to 100 per cent a year), we think that whatever advantages a crawling peg may have can be duplicated by means of a parallel currency (see chapter 5) or by de-indexing indexed wages and prices.

Since most central banks, including those that are better than average, have lacked the credibility to maintain fixed or pegged exchange rates, many economists have advocated floating exchange rates for them. An advantage of a floating exchange rate compared to a pegged rate is that a floating rate requires little credibility, because the central bank makes no promise concerning the exchange rate. The central bank need not worry that lack of credibility will cause it to lose foreign reserves supporting the exchange rate, because it need not support the exchange rate at all. Another advantage of a floating exchange rate is that in theory, full convertibility can be allowed. There need be no fear that full convertibility will create the perverse consequences that can occur with a pegged exchange rate. In practice, though, most countries with floating exchange rates impose foreign-exchange controls.

A floating exchange rate can be "clean" or "dirty." In a clean float, the central bank does not try to influence the exchange rate systematically. It is possible for a central bank to hold zero foreign reserves if it allows a clean float. The Reserve Bank of New Zealand, which has allowed a clean float since 1985 (Moore 1992: 111-12), is apparently the only central bank that has ever allowed a clean float

¹⁴ On crawling pegs, see Williamson (1981). On the related system of crawling bands, see Williamson (1996), which studies Chile, Colombia, and Israel—all of which abandoned crawling bands by 1999.

for an extended period. A central bank operating a floating rate typically practices a dirty float, in which it tries to influence the exchange rate systematically by buying or selling foreign currency. Dirty floating could be beneficial if central banks intervened with the goal of making profits, so that they acted as stabilizing speculators in foreign-exchange markets. However, they do not, and they tend to lose large amounts of money trying to counteract depreciation (Taylor 1982).

Even a clean floating exchange rate has disadvantages, the main one being that it does not counteract political pressure for inflation from interest groups and ambitious politicians who favor soft budget constraints and short-term considerations. Since the early 1980s, some central banks in developing countries have successfully combined floating exchange rates with low inflation, low real interest rates, and full convertibility, but almost no central banks in developing countries have done so over long periods (Collier and Joshi 1989: 103). Mexico's experience with floating since its currency crisis of December 1994 and Brazil's experience with floating since its currency crisis of January 1999 are not long enough to be judged successful.

Another disadvantage of a floating exchange rate is that real interest rates can be high, as they tend to be with a pegged exchange rate, if high inflation appears likely. A typical central bank maintaining a floating exchange rate may encounter difficulties like those of a typical central bank maintaining a pegged exchange rate. A low inflation rate is a "price-level peg" similar to an exchange-rate peg. Although a central bank needs little credibility to operate a floating exchange rate, it needs substantial credibility to combine low inflation with low real interest rates and full convertibility. If its credibility is low, real interest rates will be high, although probably not so high as with a pegged exchange rate that has low credibility. (Speculative pressure on the central bank tends to be less with a floating exchange rate than with a pegged exchange rate, because the central bank has no obligation to maintain a particular exchange rate. With a floating rate, speculators typically engage more in offsetting speculation against each other and less in speculation against the central bank than with a pegged rate.)

Yet another disadvantage of a floating exchange rate is that it requires the central bank to target something other than the nominal exchange rate. However, other targets have problems of definition, control, and appropriateness. Suppose a central bank decides to target the money supply. The central bank must define which measure of the money supply it wishes to control--the monetary base, or broader measures that include components beyond its direct control, such as deposits at commercial banks. The central bank must try to control the measure it has chosen, setting targets and achieving them, revising them for leads and lags in economic activity and for other factors, such as changes in banking technology and people's habits of holding money that can change the money supply unpredictably. The central bank must also frequently evaluate whether the target it has chosen is appropriate, or whether another target would be more appropriate for encouraging economic growth and price stability. Problems of defining and achieving appropriate targets caused most central banks in developed countries to abandon strict adherence to money supply targets after experimenting with money supply targets in the 1980s. However, price levels, interest rates, real growth rates, and nominal income also have problems as targets (see Lindsey and Wallich 1987).¹⁵ The nominal exchange rate is the easiest target to define, control, and evaluate.

¹⁵ An exceptionally good central bank may be able to keep inflation relatively low by targeting the price level, a measure of the money supply, or another statistic (for an example, see Jonung [1979]). However, for a typical

Because a typical currency board has high credibility, it can maintain a truly fixed exchange rate. A fixed exchange rate maintained by a currency board avoids the disadvantages of a pegged or floating exchange rate maintained by a typical central bank. A typical currency board need never worry that its foreign reserves are inadequate, because they are equal to 100 per cent or slightly more of its notes and coins in circulation. Because the exchange rate is fixed, lenders and investors tend not to demand high real interest rates as compensation for a perceived risk of depreciation against the reserve currency. A well-chosen reserve currency will be stable, credible, and fully convertible. (Chapter 4 discusses how to choose a reserve currency.) Leaving aside the issue of political risk and considering exchange risk only, a typical currency board system therefore does not experience the high real interest rates present in a typical central banking system with a pegged exchange rate and full convertibility, and present even in some central banking systems with floating exchange rates.

Convertibility and foreign-exchange controls

A currency's usefulness as a medium of exchange depends on its convertibility. Convertibility means that the currency can buy domestic and foreign goods and services, including foreign currencies. Without a convertible currency, people cannot easily make the decentralized exchanges using money that make a market economy work efficiently.

Convertibility has three gradations corresponding to the extent to which a government allows a currency to function as a medium of exchange. The most basic type of convertibility is cash convertibility--the ability to exchange a unit (say, a dollar) of bank deposits for a unit of notes and coins on demand. Cash convertibility is so much taken for granted in developed countries that it is seldom discussed, except when bank runs occur. Nevertheless, it does not exist in a few developing countries, such as the remaining centrally planned economies.

The second type of convertibility is commodity convertibility--the ability to buy domestic goods and services. It too is so much taken for granted in developed countries that it is seldom discussed. Nevertheless, it too does not exist in some developing countries. In countries with commodity convertibility, all that is usually required to buy domestic goods and services is cash or credit to pay a domestic seller; domestic trade is little restricted compared to a centrally planned economy. The exchange of goods and services is much more extensive, rapid, and efficient where commodity convertibility exists than where it does not.

The third type of convertibility is foreign-exchange convertibility--the ability to buy foreign goods and services, including foreign currencies. If no restrictions exist on buying foreign goods and services, including foreign currencies, at market rates of exchange, a currency is said to have full foreign-exchange convertibility. A currency with cash, commodity, and full foreign-exchange convertibility has full convertibility. Foreign-exchange convertibility almost always implies cash and commodity convertibility, so henceforth full convertibility will be synonymous with unrestricted foreign-exchange. The currencies of most developed countries are fully convertible, but the currencies of most developing

central bank such targets create political pressure for soft budget constraints, because the standards for evaluating their success are less transparent than for an exchange rate target.

countries are partly convertible or inconvertible. For example, many currencies are convertible for most current-account purchases, in which residents use domestic currency to buy foreign goods and services for import, but inconvertible for many capital-account purchases, in which residents use domestic currency to buy foreign financial assets such as foreign currencies and securities, and certain nonfinancial assets such as real estate.¹⁶ Restrictions on capital-account transactions are called capital controls.

Current-account convertibility exposes domestic producers to foreign competition if trade quotas and tariffs are low. Current-account convertibility tends to introduce into the domestic economy the structure of prices that prevails in world markets. World prices are signals that help people determine which areas of production to specialize in. By specializing in the goods they produce most efficiently, then trading those goods for other goods, wealth increases globally. Current-account convertibility is helpful for foreign trade, but is insufficient for attracting substantial foreign investment; for that, capital-account convertibility is necessary. Unless foreigners can repatriate some profits, they will usually be reluctant to make large investments.

Almost universal agreement exists that cash and commodity convertibility are desirable in most countries immediately. However, many economists have advised developing countries to delay full foreign-exchange convertibility (for example, Greene and Isard 1991: 12-13, 16; McKinnon 1991: 156; Williamson 1991: 379). One argument against immediate full convertibility is that it would worsen capital flight, that is, domestic investment would leave on a large scale. Another argument, inconsistent with the first, is that immediate full convertibility would allow excessive foreign investment and would thereby make export goods uncompetitive. Foreign investment increases the prices of land, labor, and other nontraded goods. Prices of exported goods would then increase because they are made partly from nontraded goods. A large, sudden appreciation of the real exchange rate could make exports uncompetitive, causing a depression (as Ronald McKinnon argues in Hanke and Walters 1991: 187-9). A third argument against immediate full convertibility is that it would create problems of moral hazard. Chile, Argentina, and Uruguay suffered banking crises in the 1980s after they abolished some restrictions on convertibility. Many companies and banks borrowed heavily abroad. Their liabilities were payable in foreign currency but their income was mainly in domestic currency. As real exchange rates appreciated, political pressure from export industries and economic pressure from currency speculators induced the central banks of those countries to devalue. Devaluation steeply increased the burden of debt repayment for companies and commercial banks that had borrowed in foreign currency, and bankrupted many. Their governments or central banks rescued them and assumed responsibility for repaying their debts.

The arguments against full convertibility, although perhaps valid for a typical central banking system, are not applicable to a typical currency board system. Immediate full convertibility in a typical currency board system is credible, so it tends to encourage a net inflow of capital rather than capital flight. Although foreign investment increases the prices of labor, land, and other nontraded goods, but if the investment is used productively, the new higher prices reflect the increased productivity of nontraded goods (Schmieding 1992: 196). The experience of currency board systems has been that foreign investment does not cause large, sudden appreciations of the real exchange rate that make exports uncompetitive and cause depressions. International capital movements, like domestic interregional

¹⁶ For more on different types of foreign-exchange convertibility, see Greene and Isard (1991: 2-3).

capital movements, tend to be self-correcting if they overreact to opportunities for arbitrage. Immediate full convertibility tends not to create problems of moral hazard in a typical currency board system because a typical currency board is not a lender of last resort. The unhappy experience of Chile, Argentina, and Uruguay with full or nearly full convertibility illustrates the moral hazard created when a central bank is implicitly a lender of last resort to commercial banks, and to private and state enterprises; it does not illustrate inherent problems of convertibility (Corbo and others 1986: 620-30).

The historical experience of currency boards supports the view that problems with full convertibility in a typical central banking system are caused by central banking rather than by full convertibility. The currency board devised by John Maynard Keynes that existed in Northern Russian from 1918 to 1920 maintained full convertibility from the day it opened, even though Russia was in the midst of civil war (Hanke and Schuler 1991a). The Burmese currency board also maintained full convertibility during a civil war (Schuler 1992b: 69-70). The currency boards of Hong Kong, Malaya, and the Philippines resumed convertibility into their reserve currencies soon after Japanese occupation during the Second World War ended (King 1957: 23, 109). No mass flight from local currencies into reserve currencies occurred; instead, convertibility encouraged foreign investment. The postwar experience of Hong Kong has been that large, uncontrolled increases in foreign investment have not hurt export industries; rather, they have equipped export industries with the tools necessary to grow (Schuler 1992b: 159-61).

The experience of these currency board systems, and the contrast with the typical experience of central banking systems, is part of a pattern. The International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions, published since 1950, describes restrictions on convertibility in its member countries and some of their colonies. Never have the majority of central banking systems reporting to it had full convertibility. Almost all developed countries with central banks now have full convertibility, but only a minority of developing countries do. Among currency board and currency board-like systems, only that of Bermuda had foreign-exchange controls. Bermuda limits the amount of funds that Bermudians may invest abroad without special permission to US\$30,000 per person per year. It is apparently the only currency board system that has ever restricted convertibility into its reserve currency, though some currency board-like systems have restricted convertibility initially.

Central banking and deficit finance

The lack of stability, lack of credibility, and restricted convertibility of a currency issued by a typical central bank results from its subordination to financing government budget deficits. In recent years, government budget deficits have been typical of developed and developing countries alike.

Most developed countries have fully convertible currencies and well-developed financial markets, so their governments can finance budget deficits by issuing debt that financial markets hold voluntarily. For example, until it reduced its government budget deficits to meet the targets for the single European currency, Italy for many years had a deficit of about 10 per cent of gross domestic product (GDP). That was a larger share of GDP than in all but a few developing countries, yet Italy had much lower inflation than most developing countries. Financial markets were willing to hold increasing amounts of Italian government bonds payable in lire. The Bank of Italy was spared from creating high inflation to finance government budget deficits, so it had some latitude for discretionary monetary policy.

Most developing countries are not like Italy. The market for their government bonds is small. Their commercial banking systems are often mere appendages of government finance. To obtain funds cheaply for their governments, commercial banks in those countries offer negative real interest rates. Negative real interest rates on domestic savings cause residents to abandon the domestic currencies as stores of value and use foreign currency and commodities instead.

Because financial markets are backward in many developing countries, the capacity of the markets to absorb government debt, even when compelled to do so, is small. That leaves inflation as the main way of financing government budget deficits. Central banks in developing countries have little scope for discretionary monetary policy because they must create inflation sufficient to finance budget deficits. The subordination of central banks and banking systems in developing countries to the demands of government finance keeps their financial systems backward, overregulated ("repressed"), and incapable of mobilizing savings efficiently to encourage economic growth (Fry 1988: 13-16).

The main argument that economists make for preferring a central bank to a currency board is that a central bank has more flexibility. On theoretical grounds the advantages of central bank flexibility are doubtful, as we will see. But even if the theoretical case for central bank flexibility were correct, a typical central bank in a developing country has little flexibility because it is subordinate to government deficit finance. A typical currency board cannot finance spending by the domestic government or by domestic state enterprises because it cannot lend to them. It cannot finance domestic government budget deficits, so it avoids subordinating the monetary system to deficit finance.

Political independence: an unattainable goal

To help central banks to resist political pressure to finance government budget deficits, the International Monetary Fund and many economists have suggested that they be politically independent (for example, Camdessus 1992: 342). Political independence for a central bank means that its governors, once appointed, have sole control of the monetary base and cannot be fired by the executive or legislative branches of government during their fixed terms of office. It also usually means that the central bank finances itself from seigniorage, rather than depending on the administration or legislature for funds, and that they cannot dictate lending by it. For developed countries, the more politically independent the central bank, the lower inflation tends to be (Alesina 1989).

However, it has been impossible to fully protect central banks from political pressure even in developed countries with long traditions of representative government and separation of powers among the branches of government. Developing countries that are still trying to achieve fully representative government and that have no indigenous tradition of separation of powers have found the task even more difficult. Furthermore, political independence does not seem to result in lower inflation for central banks in developing countries (Cukierman and others 1992: 369-76). A typical currency board, in contrast, can be protected from political pressure, as past currency boards have been. Chapter 5 proposes safeguards to provide maximum protection from political pressure for a currency board.

Inadequate staff

Besides the difficulty of protecting central banks in developing countries from political pressure, there is also the problem of finding sufficient qualified staff. The staff of many central banks, particularly those

in former centrally planned economies, lack thorough training in the art of central banking, and in many cases it is doubtful that they could administer an appropriate monetary policy even if they were protected from political pressure. After decades of investing time and money in training staff, the results in developing countries have been no better than if they had simply adopted the monetary policy of a major international currency.

A typical currency board needs only a small staff. The tasks that the staff of a currency board performs are simple and do not require as much skill as the tasks performed by the staff of a central bank.

Flexibility: a problem even in theory

A typical central bank in a developing country faces many practical obstacles to issuing a sound currency. There are also strong arguments against discretionary monetary policy, and hence against a typical central bank, on theoretical grounds. Their gist is that even a central bank that has the flexibility to act according to its best judgment, rather than in response to political pressure, is likely on average to destabilize the economy.

Theoretical arguments against discretionary monetary policy come from three sources. The monetarist school of economic thought emphasizes that long and variable lags can make the effects of discretionary monetary policy unpredictable. Unless the central bank knows approximately how long a lag exists between changes in the monetary base and changes in prices, for example, it can destabilize rather than stabilize the economy by trying to influence economic activity. Hence there is reason to think that discretionary policy on average will have worse results than rule-bound policy, even though in particular cases discretionary policy may get lucky and do better than rulebound policy (Friedman 1948, 1960; Laidler 1982: 25-34, 153-63, 187-92; Meltzer 1992). The rational expectations school of economic thought emphasizes that whatever systematic discretionary policy a central bank can administer, people can anticipate and counteract. In fact, many people, such as bankers and traders, can make profits by correctly anticipating the policy of the central bank. Their actions create problems for the central bank because much of the effectiveness of its policies depends on surprise. If people correctly anticipate that the central bank will create higher inflation, they adjust prices and interest rates accordingly, and inflation has no temporary stimulative effect on the economy. The rational expectations school claims that to the extent that a central bank has a systematic policy, people tend to anticipate the policy even if the central bank tries to hide it. The only type of central bank policy that is consistently effective, then, is one of random surprises. On average, random surprises destabilize the economy because they create unwelcome uncertainty. Monetary rules are the best attainable policy given the ability of people to anticipate and counteract the policies of the central bank. Discretionary monetary policy can easily result in higher inflation and lower economic growth than rule-bound policy (Barro and Gordon 1983, Kydland and Prescott 1977, Persson and Tabellini 1990: 19-33).

A related criticism of discretionary monetary policy, made by the "Austrian" school of economic thought, is that discretionary monetary policy is a type of central planning. Central banking has the same disadvantages as, say, central planning of agricultural production. Central planning suppresses price and quantity signals that convey information to people who have the skill to interpret them correctly. In the monetary system, among the most important signals are changes in reserves. Changes in the balance of payments or in the public's holdings of notes and coins cause changes in reserves and, through them, in the money supply, interest rates, and income. Discretionary monetary policy, to be worthy of the name,

must try to fight markets as they adjust toward a new set of market-clearing (equilibrium) prices. By doing so, it usually makes adjustment more prolonged and costly. Luck may occasionally enable discretionary monetary policy to have beneficial effects. On average, though, discretionary monetary policy is harmful, because a central bank has no way of knowing in advance, or often even in retrospect, which discretionary policies are beneficial and which are harmful (Selgin 1988b: 85-125).

The monetarist school and Austrian school emphasize aspects of the central bank's ignorance, whereas the rational expectations school emphasizes the central bank's inability to surprise people with systematic policy. Although none of the three schools has ever considered in detail a currency board as a monetary rule, the arguments of all three schools lend support to the case for currency boards, since currency boards are rule-bound and have no discretion in monetary policy.

Advocates of discretionary monetary policy consider it undesirable for governments to renounce discretionary monetary policy as a possible tool for making real adjustments in national economies. As an example of the benefits that discretionary monetary policy can bring, they appeal to cases in which nominal wages are too high for full employment, yet rigid, so that some people who wish to work cannot find jobs. A central bank, they say, can increase employment by creating inflation. Inflation can reduce real wages and make the domestic currency depreciate against foreign currencies, causing a temporary increase in exports.

When considering the validity of these examples, one must ask why nominal wages are rigid. The reasons are usually that people expect that the central bank will inflate, and that laws give workers who already have jobs special privileges protecting them from competition by unemployed workers. If the central bank and special privileges for already employed workers were abolished, greater incentives would exist for nominal wages to become flexible. Central banking is the problem rather than the solution in the example. Nominal wages have been flexible in Hong Kong and other currency board systems, even though currency board systems have rarely needed flexibility because strong economic growth has resulted in generally increasing real and nominal wages.

A currency board cannot administer a discretionary monetary policy, so its policy is inflexible. Rather than being a disadvantage, though, the inflexibility of a currency board tends to protect an economy from the destabilizing effects of discretionary monetary policy and tends to force wages and prices to be flexible. The case for establishing a currency board or other monetary rule is much the same as the case for establishing a constitution that limits the powers of government. Constraints external to day-to-day politics are necessary to prevent most governments from abridging political freedoms. It is possible for a government to agree to bind itself to constitutional constraints, and to create institutions that successfully enforce the constraints, even though the government would not behave in the same manner if no constitutional constraints existed. Constitutions are desirable because even a government that respects political freedoms at one time may later abridge them unless a constitution establishes them as durable features of political life. The experience of constitutions is far from perfect, but it does support the claim that a constitution can be more effective at constraining the powers of government than no constitution.

A currency board is a form of monetary constitution that prevents the domestic government from abridging economic freedoms by levying a high inflation tax not desired by the public. Because a currency board cannot finance budget deficits of the domestic government, the currency board system

establishes an implicit low-inflation fiscal constitution. A clever, very determined government can probably find ways to subvert a currency board, just as it can subvert a political constitution, but safeguards can secure a new currency board maximum protection from such scheming and should be sufficient to deter a less than very determined government.¹⁷

¹⁷ On the case for a fiscal constitution, see Buchanan and Wagner (1977). On a monetary constitution, see Grilli and others (1991) and Yeager (1962, 1992).

3. CURRENCY BOARDS, CENTRAL BANKS, AND THE MONEY SUPPLY

Because a typical central bank in a developing country has great difficulty providing a sound currency, developing countries should consider a different approach to providing a sound currency, namely, establishing a currency board. We will show how the money supply is determined in a currency board system, how to establish a currency board, and how to operate the currency board and protect it from political pressure to convert it into a central bank.

Money supply in a currency board system

A typical currency board system relies entirely on market forces to determine the amount of notes and coins that the currency board supplies. Market forces also determine other components of the supply of money in the broad sense (in the examples here, the public's deposits at commercial banks) by processes described below.

In a currency board system and a central banking system alike, commercial banks are entrepreneurs of credit. A commercial bank cannot for long lend more to borrowers than depositors wish to lend to the bank, in the form of deposits held instead of spent. If a commercial bank lends excessively, the borrowers spend the excess, for instance by writing cheques. In the payments system, more funds flow out of the bank than flow into the bank. To prevent the outflow from bankrupting it, a commercial bank holds reserves. The loans of commercial banks are limited by their need to maintain sufficient reserves to enable depositors to convert deposits into reserves on demand and to withstand outflows of reserves through the payments system.

A typical currency board has no active role in determining the monetary base. A fixed exchange rate with the reserve currency and the requirement that the currency board hold 100 per cent foreign reserves prevent it from increasing or decreasing the monetary base at its own discretion. Nor does a typical currency board influence the relationship between the monetary base and the money supply by imposing reserve ratios or otherwise regulating commercial banks. The money supply in a typical currency board system, therefore, is determined entirely by market forces. A typical central bank, in contrast, can at its discretion increase or decrease the monetary base. It can lend to commercial banks, creating reserves for them, even if its foreign reserves are decreasing. More reserves tend to enable commercial banks to make more loans, which they do by creating deposits for borrowers. The money supply then increases. Decreasing the monetary base tends to have the opposite effect. Besides changing the monetary base, a typical central bank can also influence the supply of commercial bank loans by changing the reserve requirements for commercial banks.

Despite the inability of a typical currency board to create reserves for commercial banks at its own discretion, the money supply in a typical currency board system is quite elastic (responsive) to changes in demand, because the system can acquire foreign reserves. The elasticity of the money supply in a currency board system is one reason that Hong Kong has for years been among the world's leading centers of ample, low-cost finance. The rules governing a currency board merely prevent it from creating reserves for commercial banks in an inflationary manner, as a central bank can. Other sources of elasticity in the money supply are variability in commercial banks' ratio of reserves to deposits, the pooling of reserves among branches commercial banks in the currency board country and the reserve country, interbank lending, and variability in the public's deposit-to-cash ratio. To simplify exposition,

most the discussion that follows omits mention of sources of elasticity other than the acquisition of foreign reserves.

The ultimate reserves in a currency board system are the monetary base of the reserve currency. The only way to acquire the ultimate reserves is to obtain them from the reserve country.¹⁸ In its simplest form, that requires achieving a current-account surplus. Making certain assumptions about a currency board system, changes in the current-account balance begin a sequence of events that change the money supply in the same direction. A current-account surplus ultimately increases the money supply, whereas a current-account deficit ultimately decreases the money supply. (The overall balance of payments is the gain or loss of reserves in a period. It consists of the current-account balance--trade in goods and services--plus the capital-account balance--investment and gifts.) The assumptions that underlie this simplified description of the money supply process in a currency board system are:

1. Deposits of commercial banks are convertible into currency board notes and coins (cash) at a fixed rate.
2. The currency board is the only domestic issuer of notes and coins.
3. Commercial banks' ratio of reserves to deposits is constant.
4. The public's ratio of currency board notes and coins to commercial bank deposits to is constant.
5. Income and the money supply move in the same direction.
6. There is no international branch banking between the currency board country and the reserve country.
7. Changes in the balance of payments occur only in the current account; the capital account does not change.
8. No binding minimum reserve ratios or other special bank regulations exist.
9. People do not hold reserve currency or use the reserve currency in domestic transactions.¹⁹

To show how money is supplied in a currency board system, and how the process differs under central banking, we will use a combination of balance sheets and flow diagrams. The flow diagrams (Figures 3.2, 3.6, 3.10, and 3.11) depict sequences of events, whereas the balance sheets depict conditions at particular stages for the relevant agents.²⁰ Figure 3.1 shows simplified balance sheets for a typical currency board as well as the combined balance sheet of commercial banks and the combined balance sheet of members of the public. (The public is anyone other than the currency board and commercial banks.) Recall that in a balance sheet, by definition, assets = liabilities + net worth. The money supply is the left-hand (asset) side of the public's balance sheet.

Figure 3.2 is a flow diagram that illustrates an initial situation where the current account balance is zero: the value of exports equals the value of imports. Now assume that a current-account surplus occurs. As the surplus works its way through the monetary system, the currency board plays an explicit (though passive) role in the sequence only at the stage labeled "demand for goods in general, including currency

¹⁸ This assumes that the ultimate reserves are used only in the currency board system and the reserve country, not elsewhere. In reality, ultimate reserves of some currencies are held outside of their country of origin; for example, U.S. dollar notes are held extensively in Latin America.

¹⁹ Only assumption 1 is necessary for the analysis of currency boards; the other assumptions can be discarded, but the analysis then becomes much more complicated. See Ow (1985) and Walters and Hanke (1992) for details.

²⁰ The account that follows borrows liberally from Greenwood (1981, 1983a).

board notes and coins, increases." The system is self-adjusting, and it eventually achieves a new equilibrium, that is, the current-account balance returns to zero and the relevant markets clear.

Figure 3.1. Balance sheets

Currency board	
Assets	Liabilities
Foreign reserves	Notes in circulation (optional)
	Deposits of commercial banks
	Net worth
Commercial banks	
Assets	Liabilities
Currency board notes (reserves)	Deposits of public
Loans to public	Net worth
Public	
Assets	Liabilities
Currency board notes	Bank loans
Bank deposits	Net worth

Monetary base = notes in circulation in currency board's balance sheet
 Money supply = currency board notes + bank deposits in public's balance sheet
 Commercial banks' ratio of reserves to deposits = currency board notes ÷ deposits of public in commercial banks' balance sheet
 Public's ratio of currency to deposits = currency board notes ÷ bank deposits in public's balance sheet

To illustrate the relationship between commercial banks and the currency board in the sequence of events illustrated in Figure 3.2, the balance sheets that follow use hypothetical numbers. The "initial stage" of the balance sheets (Figure 3.3) is the first stage of Figure 3.2, a situation where the current-account balance is zero and the relevant markets clear--an equilibrium. For the sake of simplicity, assume that net worth in the balance sheet of the currency board and stockholders' equity in the balance sheets of commercial banks are zero. Assume further that commercial banks desire a reserve ratio of 2 percent, and that the public desires a currency-to-deposit ratio of 10 percent. Initially, 600 units of currency board notes and coins are in circulation. (The numbers in the examples that follow were chosen because they result in convenient whole-number solutions. Numbers in bold represent changes from the previous stage.)

Now let there be a current-account surplus of 12 units, in the form of foreign currency that the domestic public deposits in domestic commercial banks. Since, by assumption, commercial banks hold all reserves in the form of currency board notes and coins, the banks exchange the foreign currency for currency board notes and coins. The assets and liabilities of the currency board become 12 units more than in the initial stage, reserves of commercial banks become 12 units more than in the initial stage, and deposits

of the public at commercial banks become 12 units more than in the initial stage. Furthermore, the money supply is 12 units more than in the initial stage. This is the intermediate stage (Figure 3.4).

Figure 3.2. Money supply increase in a currency board system

1. Current-account balance is zero (exports equal imports)--equilibrium (Figure 3.3)
2. Domestic demand for imported goods decreases or foreign demand for currency board country's goods increases
3. Current-account surplus (exports exceed imports)
4. Reserves of commercial banks increase
5. Loans by commercial banks increase (Figure 3.4)
6. Interest rates decrease
7. Income increases
8. Demand for goods in general, including currency board notes and coins, increases
9. Prices of domestic goods increase
10. Domestic demand for foreign goods increases or foreign demand for currency board country's goods decreases
11. Current-account balance returns to zero--new equilibrium (Figure 3.5)

Figure 3.3. Money supply increase in a currency board system, initial stage

Currency board			
Assets		Liabilities	
Foreign reserves	600	Notes in circulation	600
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves)	100	Deposits of public	5,000
Loans to public	4,900	Net worth	0
Public			
Assets		Liabilities	
Currency board notes	500	Bank loans	4,900
Bank deposits	5,000	Net worth	600
Monetary base = 600			
Money supply = 5,500			
Commercial banks' ratio of reserves to deposits = 100:5000 = 2% (equilibrium)			
Public's ratio of currency to deposits = 500:5000 = 10% (equilibrium)			

Figure 3.4. Money supply increase in a currency board system, intermediate stage

Currency board			
Assets		Liabilities	
Foreign reserves +12	612	Notes in circulation +12	612
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves) +12	112	Deposits of public +12	5,012
Loans to public	4,900	Net worth	0
Public			
Assets		Liabilities	
Currency board notes	500	Bank loans	4,900
Bank deposits +12	5,012	Net worth +12	612
Monetary base = 612 (expansion = 12 over initial stage)			
Money supply = 5,512 (expansion = 12 over initial stage)			
Commercial banks' ratio of reserves to deposits = 112:5012 = approximately 2.23% (disequilibrium)			
Public's ratio of currency to deposits = 500:5012 = approximately 9.98% (disequilibrium)			

Figure 3.5. Money supply increase in a currency board system, final stage

Currency board			
Assets		Liabilities	
Foreign reserves	612	Notes in circulation	612
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves) -10	102	Deposits of public +88	5,100
Loans to public +98	4,988	Net worth	0
Public			
Assets		Liabilities	
Currency board notes +10	510	Bank loans +98	4,998
Bank deposits +88	5,100	Net worth	612
Monetary base = 612 (expansion = 12 over initial stage, no change over intermediate stage)			
Money supply = 5,610 (expansion = 110 over initial stage, 98 over intermediate stage)			
Commercial banks' ratio of reserves to deposits = 102:5100 = 2% (equilibrium)			
Public's ratio of currency to deposits = 510:5100 = 10% (equilibrium)			

Notice that commercial banks have a reserve ratio of approximately 2.23 percent in the intermediate stage, which is more than their desired, initial ratio of 2 percent. Notice also that the public has a currency-to-deposit ratio of approximately 9.98 percent in the intermediate stage, which is less than its desired, initial ratio of 10 percent. Hence the monetary system is in disequilibrium (the relevant markets do not clear). Commercial banks therefore increase their loans, and the public increases its holdings of cash, to restore the ratios of the initial stage. In the final stage, they do so, achieving a new equilibrium, with the money supply now 110 units more than it was in the initial stage (see Figure 3.5).

As the balance sheets illustrate, efforts by commercial banks to reattain their desired reserve ratio, and by the public to reattain its desired ratio of currency to deposits, increase the money supply. Their efforts cause changes in interest rates, prices, and incomes that move the currency board system to a new equilibrium when a current-account surplus occurs. The foregoing example in a sense collapses the effects of those relationships into the reserve ratio of commercial banks and the public's ratio of currency to deposits. The currency board responds passively by virtue of its 100 per cent reserve ratio, its fixed exchange rate with the reserve currency, and its inability to change the reserve ratio of commercial banks by imposing reserve requirements on them.

When a current-account deficit occurs in a currency board system, the money supply process works as in Figure 3.6. As in the case of a current-account surplus, the monetary system is initially in equilibrium, and the balance sheets of the currency board, commercial banks, and the public are initially as in Figure 3.7, which is the same as Figure 3.3.

Now let there be a current-account deficit of 12 units. Foreigners only accept payment in foreign currency. By assumption, the currency board has all the foreign currency in the domestic monetary system. Domestic residents obtain reserve currency by converting 12 units of deposits at commercial banks into currency board notes and coins, then converting the currency board notes and coins into foreign currency. The assets and liabilities of the currency board become 12 units less than in the initial stage, reserves of commercial banks become 12 units less than in the initial stage, and deposits of the public at commercial banks become 12 units less than in the initial stage. Furthermore, the money supply is 12 units less than in the initial stage. This is the intermediate stage (see Figure 3.8).

Notice that commercial banks have a reserve ratio of approximately 1.76 percent in the intermediate stage, which is less than their desired, initial ratio of 2 percent. Notice also that the public has a deposit-to-cash ratio of approximately 10.02 percent in the intermediate stage, which is more than its desired, initial ratio of 10 percent. Hence the monetary system is in disequilibrium. Commercial banks therefore decrease their loans, and the public decreases its holdings of cash, to restore the ratios of the initial stage. In the final stage, they do so, achieving a new equilibrium, with the money supply now 110 units less than it was in the initial stage (see Figure 3.9).

Figure 3.6. Money supply decrease in a currency board system

1. Current-account balance is zero (exports equal imports)--equilibrium (Figure 3.7)
2. Domestic demand for imported goods increases or foreign demand for currency board country's goods decreases
3. Current-account deficit (exports are less than imports)
4. Reserves of commercial banks decrease
5. Loans by commercial banks decrease (Figure 3.8)
6. Interest rates increase
7. Income decreases
8. Demand for goods in general, including currency board notes and coins, decreases
9. Prices of domestic goods decrease
10. Domestic demand for foreign goods decreases or foreign demand for currency board country's goods increases
11. Current-account balance returns to zero--new equilibrium (Figure 3.9)

Figure 3.7. Money supply decrease in a currency board system, initial stage

Currency board			
Assets		Liabilities	
Foreign reserves	600	Notes in circulation	600
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves)	100	Deposits of public	5,000
Loans to public	4,900	Net worth	0
Public			
Assets		Liabilities	
Currency board notes	500	Bank loans	4,900
Bank deposits	5,000	Net worth	600
Monetary base = 600 Money supply = 5,500 Commercial banks' ratio of reserves to deposits = 100:5000 = 2% (equilibrium) Public's ratio of currency to deposits = 500:5000 = 10% (equilibrium)			

Figure 3.8. Money supply decrease in a currency board system, intermediate stage

Currency board			
Assets		Liabilities	
Foreign reserves -12	588	Notes in circulation -12	588
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves) -12	88	Deposits of public -12	4,988
Loans to public	4,900	Net worth	0
Public			
Assets		Liabilities	
Currency board notes	500	Bank loans	4,900
Bank deposits -12	4,988	Net worth -12	588
Monetary base = 588 (contraction = 12 over initial stage)			
Money supply = 5,488 (contraction = 12 over initial stage)			
Commercial banks' ratio of reserves to deposits = 88:4988 = approximately 1.76% (disequilibrium)			
Public's ratio of currency to deposits = 500:4988 = approximately 10.02% (disequilibrium)			

Figure 3.9. Money supply decrease in a currency board system, final stage

Currency board			
Assets		Liabilities	
Foreign reserves	588	Notes in circulation	588
		Net worth	0
Commercial banks			
Assets		Liabilities	
Currency board notes (reserves) +10	98	Deposits of public -88	5,100
Loans to public -98	4,900	Net worth	0
Public			
Assets		Liabilities	
Currency board notes -10	490	Bank loans -98	4,802
Bank deposits -88	4,900	Net worth	588
Monetary base = 588 (contraction = 12 over initial stage, no change over intermediate stage)			
Money supply = 5,390 (contraction = 110 over initial stage, 98 over intermediate stage)			
Commercial banks' ratio of reserves to deposits = 98:4900 = 2% (equilibrium)			
Public's ratio of currency to deposits = 490:4900 = 10% (equilibrium)			

As in the case of a current-account surplus, efforts by banks to reattain their desired deposit-to-reserve ratio, and by the public to reattain its desired ratio of currency to deposits, reduce the money supply and move the currency board system to a new equilibrium when a current-account deficit occurs.

We made some simplifying assumptions earlier. If we discard them, the picture becomes too complex to analyze easily. However, the many additional factors that can complicate the analysis should not obscure the main point: market forces determine and limit expansion of the money supply in the currency board system. As long as it is more profitable to invest funds in the currency board country than elsewhere (after making allowances for differences in rates of inflation, exchange risk, political risk, and transaction fees), commercial banks in the currency board system tend to increase their loans. They can do so because foreign investment tends to occur, bringing additional foreign reserves to the currency board system. Eventually commercial banks expand their loans in the currency board system to such an extent that making further loans there is less profitable than investing the funds abroad. At that point, commercial banks hold the supply of loans constant in the currency board system, and the money supply ceases to increase.

Market forces rather than discretionary action by the currency board cause the money supply to adjust to the current-account balance. The monetary system is self-adjusting. The currency board is passive in response to changes in demand for notes and coins; it merely supplies whatever quantity is demanded at the fixed exchange rate with the reserve currency. Because the exchange rate is fixed, arbitrage occurs through changes in the money supply, interest rates, and the current-account balance, rather than through the exchange rate. In that respect, the currency board system is like the "classical" gold standard or gold-exchange standard practiced by many central banks before the First World War, which had truly fixed exchange rates.

Arbitrage is the key to changes in the money supply of a currency board system. It works by making prices in the reserve country an "anchor" for nominal prices in the currency board country.²¹ The currency board maintains a fixed exchange rate with the reserve currency, but it controls no other nominal or real price in the economy. Instead, arbitrage determines those other prices. Arbitrage also occurs with a floating exchange rate, but exchange risk creates additional costs that tend to make arbitrage less efficient than it is with fixed exchange rates.²²

Suppose the U.S. dollar is the reserve currency; then U.S. prices are the anchor for prices in the currency board country. If disparities in prices exist, so that, for example, timber costs more in the United States than in the currency board country after making allowance for taxes and transportation, traders will tend to buy timber in the currency board country and sell it in the United States. Overall price changes, as reflected in wholesale price indexes, will tend to be similar in the currency board country and the United States. If the currency board country has secure property rights, eliminates barriers to foreign investment, and has taxes no greater than those in the United States, interest rates will also tend toward American levels. Wages in the currency board country will tend to increase at about the same

²¹ For a general discussion of the role of a nominal anchor, see Bruno (1991).

²² Quotas and high tariffs also reduce the efficiency of arbitrage, which is one reason that the alternative approach to economic reform discussed in chapter 1 recommends deregulation of trade.

rate as in the United States, plus an allowance for gains in productivity. Real wages can thus increase quickly in the currency board system if productivity increases.

An exception to the foregoing remarks about arbitrage is that consumer price indexes can diverge between the currency board country and the reserve country. Divergence can occur because consumer price indexes contain many nontraded goods, such as rent and local services, whereas wholesale price indexes mainly contain traded goods, such as foodstuffs, minerals, and manufactures. Ultimately, prices of domestically produced traded goods reflect the cost of both the nontraded goods (particularly rent and wages) and the traded goods used to produce them. In a currency board system, prices of nontraded goods can persistently increase faster than prices of traded goods, although indirect arbitrage through traded goods tends to limit increases in the prices of nontraded goods to the extent justified by increases in productivity. For example, suppose that the productivity of labor in export industries increases 4 per cent a year in the currency board country and zero percent a year in the United States, the reserve country. Suppose further that inflation in the prices of export goods from the currency board country is zero and that inflation in all United States price indexes is zero. Consequently, real wages can increase 4 per cent a year in the export sector in the currency board country versus zero percent a year in the United States without affecting the competitiveness of goods exported from the currency board country to the United States. Suppose that real wages in export industries in the currency board country do increase 4 per cent a year. To avoid losing workers to export industries, other industries in the currency board country must increase real wages and the nominal prices they charge consumers. Wages in the currency board country then tend to increase faster than wholesale prices because average productivity is increasing. The consumer price index increases in the currency board country, whereas the American consumer price index does not change. In these circumstances, the change in the consumer price index in the currency board country is a sign of a structural change in the economy of the currency board country toward activities that add more value to production.

The experience of currency board countries confirms both the effectiveness of arbitrage with the reserve country for prices of traded goods and the possibility of divergence in the rates of inflation for prices of wages, rents, and other nontraded goods. In Hong Kong, interest rates and the prices of exported goods have closely followed their counterparts in the United States since 1983, when Hong Kong returned to the currency board system and the U.S. dollar became Hong Kong's reserve currency again. Average wages and the consumer price index, however, have increased more in Hong Kong than in the United States because productivity, and hence real output per person, have increased faster in Hong Kong (Culp and Hanke 2014).

For the sake of clarity, the foregoing exposition of how the money supply adjusts to the balance of payments in a currency board system made some simplifying assumptions. Real conditions are never so simple. It is in fact common in a currency board system for the money supply to change in the opposite direction from the current-account balance. One factor that can loosen or break the link between the money supply and the current-account balance is foreign investment, which is part of the capital-account balance. Foreign investment can offset or exceed current-account deficits, resulting in a gain of reserves. Hong Kong had current-account deficits for decades at a time, yet its money supply increased because Hong Kong attracted large inflows of foreign investment. The pattern holds generally for fast-growing countries that maintain fixed exchange rates (Jonung 1984: 366-7, 383; Schuler 1992b: 159, 178-9, 204-8).

Money supply in a central banking system

A typical currency board cannot administer a discretionary monetary policy because a fixed exchange rate with the reserve currency and the requirement that the currency board hold 100 per cent foreign reserves allow it no discretion. The currency board does not alter the exchange rate, nor does it actively control the monetary base or regulate commercial banks. Its influence on real economic activity is passive: it provides a sound currency for economic agents to use as they wish. The stated purposes of a typical central bank, in contrast, are to stabilize the price level and influence real economic activity by controlling such instruments of monetary policy as the monetary base, reserve requirements, and interest rates charged by commercial banks. Unlike a typical currency board, a typical central bank can administer a discretionary monetary policy, and unlike commercial banks, its decisions are not necessarily guided by considerations of economic profit and loss. A typical central bank is bound neither by strict rules concerning its behavior nor by the discipline of profit and loss.

To reiterate, a central bank is a monetary authority that has discretionary monopoly control of the supply of the reserves of commercial banks, and usually also a monopoly of the supply of notes and coins. A typical central bank performs other functions besides supplying reserves of commercial banks plus its notes and coins in circulation (which are the components of the monetary base in a typical central banking system). A typical central bank regulates commercial banks, acts as their lender of last resort, gives economic advice to the government, and perhaps helps operate the payments system. Those functions are secondary to its role in supplying the monetary base, though.

Usually, only the central bank controls the monetary base, whereas other government bodies can and often do perform the secondary functions. For example, in the United States, only the Federal Reserve System supplies Fed funds (deposit reserves of commercial banks) and notes, but it shares regulatory powers with the Treasury Department, powers as a lender of last resort with government deposit insurance agencies,²³ duties as an economic advisor with several other government bodies, and the operation of the payments system with private organizations. The discussion that follows omits consideration of the secondary functions of a typical central bank and concentrates on how a typical central bank supplies the monetary base, and how its actions affect economic activity.

In a typical currency board system, the starting point in the sequence of events in the example of an increase in the money supply (Figure 3.2) was a decrease in the demand for imported goods in the currency board country or an increase in foreign demand for the currency board country's goods. Changes in demand for goods originate in the market, as a result of changes in people's desires. In a typical central banking system, in contrast, the starting point can be a decision by the central bank to increase the monetary base; perhaps it does so to finance deficit spending by the government. That is not a decision that originates in the market.

Diagrammatically, the simplified sequence of events for an unexpected increase in the monetary base in a typical central banking system is as in Figure 3.10. We consider only the case of an unexpected increase to avoid complications of the type emphasized by the "rational expectations" school of economists. The discussion of the money supply process here assumes that the central bank maintains a

²³ The Federal Reserve System will lend to government deposit insurance agencies whose funds are depleted. It is the ultimate lender of last resort in the American monetary system

floating exchange rate. A floating exchange rate allows the greatest discretionary control of the monetary base, and hence differs most from the fixed exchange rate maintained by a typical currency board. Since a pegged exchange rate maintained by a typical central bank tends not to persist, periodic devaluations of a pegged rate offer almost as much long-run persist, periodic devaluations of a pegged rate offer almost as much long-run discretionary power to increase the nominal monetary base as would exist if the central bank operated a floating exchange rate.

To show more clearly the contrast with a typical currency board system, assume that there are no lags: nominal prices adjust very quickly, leaving real prices unchanged. The only effect of the central bank's action is that the domestic currency depreciates against foreign currency. If instead, more realistically, some nominal prices are "sticky," the central bank's action has real effects on the economy. In the sequence in Figure 3.10, the likely effect of the central bank's action is that the real exchange rate will depreciate, that is, prices of nontraded goods will decrease compared to the prices of traded goods. That will cause a temporary increase in exports, because nominal wages and prices will take some time to increase in response to the depreciation of the exchange rate. In the meantime, real wages and prices will be lower than before. (If the nominal exchange rate were pegged rather than floating, the likely immediate effect of the central bank's action would be the opposite: the real exchange rate would temporarily appreciate, causing a decrease in exports. Eventually, though, a typical central bank would probably devalue, and the monetary system would then attain a new, though probably transitory, equilibrium.)

Figure 3.10. Money supply increase in a central banking system with a floating exchange rate

1. Equilibrium--say, 1 unit of domestic currency = US\$1
2. Unexpected decision by central bank to increase monetary base (say, by lending to government)
3. Reserves of commercial banks increase
4. Loans by commercial banks increase
5. Exchange rate of domestic currency depreciates to 1.05 units = US\$1--new equilibrium

Figure 3.11. Money supply decrease in a central banking system with a floating exchange rate

1. Equilibrium--say, 1 unit of domestic currency = US\$1
2. Unexpected decision by central bank to decrease monetary base (say, by selling assets)
3. Reserves of commercial banks decrease
4. Loans by commercial banks decrease
5. Exchange rate of domestic currency appreciates to 0.95 units = US\$1--new equilibrium

The sequence of events for an unexpected decrease in the monetary base in a typical central banking system with a floating exchange rate is as in Figure 3.11. Again, the figure omits consideration of expectations and lags, and assumes that nominal prices adjust very quickly, leaving real prices unchanged. The only effect of the central bank's decision is that the domestic currency appreciates against foreign currency. If some nominal prices are "sticky," the likely effect of the central bank's actions is that the real exchange rate will appreciate, that is, prices of nontraded goods will increase

compared to prices of traded goods. That will cause a temporary decrease in exports, because nominal wages and prices will take some time to decrease in response to the depreciation of the exchange rate. In the meantime, real wages and prices will be higher than before. (If the nominal exchange rate were pegged rather than floating, the likely immediate effect of the central banks' action would be the opposite: the real exchange rate would temporarily depreciate, causing an increase in exports. Eventually, though, the real exchange rate would appreciate and the monetary system would then attain a new, though probably transitory, equilibrium.)

Central banks sometimes mistaken for currency boards

A few central banking systems are sometimes mistaken for currency board systems. Among them are the monetary systems of Singapore and the CFA franc zone. Singapore had a currency board until 1973, but since then it has been a central banking system and the Singapore dollar has been a floating currency. As a vestige of the years until 1973, Singapore still has a Board of Commissioners of Currency that issues notes and holds 100 percent foreign reserves against notes in circulation. Unlike a currency board, though, the body is not required to redeem notes in foreign currency at a fixed exchange rate. Real power in monetary policy is vested in the de facto central bank, the Monetary Authority of Singapore. The Monetary Authority of Singapore in effect directs the Board of Commissioners of Currency because both bodies have the same people as their directors. The Monetary Authority of Singapore is not required by law to maintain any specific reserve ratio, but in practice it holds approximately 100 percent foreign reserves against the monetary base.

The CFA franc, the common currency of 14 African countries, had a pegged exchange rate with the French franc that has continued with the franc's successor, the euro. The central banks that issue the CFA franc are only required to hold a minimum of 20 percent foreign reserves, not 100 percent like currency boards. This feature caused them trouble in 1993 and 1994, when the central banks first suspended convertibility into the French franc and then devalued the CFA franc from 50 per French franc to 100 per French franc.

Other central banking systems sometimes mistaken for currency board systems hold 100 per cent reserves only against some liabilities. A central bank required to hold 100 per cent foreign reserves against notes and coins in circulation, but not against deposits, is not a currency board. To illustrate the difference, compare the balance sheets in Figure 3.12, which use hypothetical numbers. For simplicity, assume that net worth is zero. Assume for the moment that the currency board, like a minority of past currency boards, accepts deposits from commercial banks. Assuming that the currency board accepts deposits makes comparison of the balance sheets simpler. The currency board holds 100 per cent foreign reserves against its deposits and against its notes and coins in circulation. For a given amount of total liabilities, the foreign reserves of the currency board are the same whether the liabilities are held as notes and coins or as deposits. The currency board holds 100 per cent foreign reserves against all liabilities, no matter what form the liabilities take. The reasons that most currency boards have issued notes and coins only, and have not accepted deposits, originate from historical peculiarities, not from inherent differences in notes and coins versus deposits as liabilities.

Figure 3.12. Central bank and currency board balance sheets

Central bank			
Assets		Liabilities	
Foreign reserves	150	Notes and coins in circulation	150
Domestic securities	600	Deposits of commercial banks	600
		Net worth	0
TOTAL	750	TOTAL	750
Currency board			
Assets		Liabilities	
Foreign reserves	750	Notes and coins in circulation	150
Domestic securities	0	Deposits of commercial banks	600
		Net worth	0
TOTAL	750	TOTAL	750

The foreign securities (foreign reserves) of the central bank in Figure 3.12 are equal to its notes and coins in circulation, and its total securities (foreign and domestic) are equal to its notes and coins in circulation plus the deposits of commercial banks with it. That does not make the central bank a currency board, however. The liabilities of the central bank, like those of a currency board that accepts deposits, include deposits of commercial banks as well as notes and coins in circulation. The different types of liabilities are interchangeable: for instance, a one-unit deposit at the central bank or the currency board can be converted into a one-unit note issued by the central bank or the currency board, respectively.

For the purpose of the example, what matters is not the ratio of foreign securities to notes and coins, but the ratio of foreign securities to all liabilities. To illustrate the point, suppose that all deposits at the central bank and the currency board are converted into notes and coins. The total liabilities of the central bank and the currency board remain unchanged at 750 units. The central bank will have 150 units of foreign securities and 750 units of notes and coins in circulation, making a reserve ratio of 20 per cent. The currency board, in contrast, will have 750 units of foreign securities and 750 units of notes and coins in circulation, making a reserve ratio of 100 per cent. To become a currency board, the central bank of Figure 3.12 would have to increase its foreign securities to 750 units and sell its domestic securities, or maintain its foreign securities at 150 units and cease to accept deposits from commercial banks.

In a currency board system, only the liabilities of the currency board must be backed 100 per cent by foreign reserves. Few currency board countries have imposed reserve requirements on commercial banks. Commercial banks in currency board systems have often held reserves as low as a few per cent of deposits; contrary to a misconception (Congdon 1985: 95), it is not necessary for them to hold 100 per cent foreign reserves. Nor is the currency board system like the Chicago Plan proposed by economists at the University of Chicago during the 1930s, which would require commercial banks to hold 100 per cent reserves in domestic government securities (Simons 1934: 18, 25-6). Nor is a currency board system like

proposals for gold warehouse banking, which would forbid commercial banks to invest in interest-earning assets (Rothbard 1962).

We stress the importance of formal institutional protection for countries that wish to establish currency boards today. Many past currency boards, especially in British colonies, have lacked formal legal protection from changes in their operating rules. They have had much informal protection, though. Most have been managed by British or British-trained civil servants who absorbed a long tradition of financial rectitude. Most British colonial currency boards have had fixed exchange rates with the pound sterling, and the British government would have fired colonial officials who tried to devalue colonial currency against sterling. For independent countries, the lack of informal protection makes it all the more important to establish formal legal protection such as chapter 5 and the Appendix suggest. A central bank that mimics currency board-type rules but can stop doing so at any time is unlikely to obey the rules for long, hence it will tend to have low credibility.

A brief history and assessment of currency boards

It is now time to summarize briefly the historical record of currency boards and indicate the extent to which it supports the case for currency boards. The summary is based on a synthesis of many studies.²⁴

More than 70 countries have had currency boards (for a list, see Hanke, Jonung, and Schuler 1993: Appendix C). The first currency board was established in 1849 in the British Indian Ocean colony of Mauritius. Currency boards spread slowly until about 1900, when a few other British colonies and Argentina, an independent country, established currency boards. After 1900, currency boards became the monetary arrangement of choice for British colonies and for some independent developing countries. Currency boards reached their greatest extent about 1950, when much of Africa, the Caribbean, and South Asia had currency boards. Like the European Central Bank today, some British colonial currency boards were joint currency boards that served three or more countries apiece.

Currency board systems have typically been successful in encouraging foreign investment. With currency boards, many countries have taken the decisive step from primitive monetary conditions to modern monetary systems that include sophisticated banking and foreign-exchange services. Inflation in currency board systems has typically been low, which has encouraged the use of modern currency in transactions. Economic growth has typically been satisfactory, and in some cases spectacular. Trade in export goods that have remained characteristic of certain countries originated during the years of the currency board system. Export of cocoa and peanuts in West Africa, rubber and tin in Malaysia, and textiles and financial services in Hong Kong all developed under currency boards.

Currency board systems have typically been stable. All currency boards have successfully maintained fixed exchange rates and full convertibility into their reserve currencies, although in the 1970s some currency boards changed from sterling to more stable reserve currencies. Even during the Great

²⁴ See Blowers and McLeod (1952), Caine (1950), Chalmers (1893), Clauson (1944), Crick (1965), Drake (1966, 1969), Edo (1975), Freris (1991), Ghose (1987), Greaves (1953), Jao (1974), Jao and King (1990), King (1957), Kratz (1966), Lee (1974, 1986) Loynes (1962), Nelson (1984), Newlyn and Rowan (1954), Sayers (1952), and Shannon (1951, 1952). More recent works that summarize the history of the currency board system include Schuler (1992b) and Schwartz (1992a).

Depression, all currency boards then existing maintained fixed exchange rates and full convertibility, unlike almost all central banks then existing. The oldest remaining currency board, in the Falkland Islands, has maintained a fixed exchange rate of Falklands £1 per £1 sterling since it opened in 1899. Currency boards have also helped some countries recover quickly from wartime occupation. During the Second World War, Hong Kong, Malaya, and the Philippines, which had currency boards, were occupied by the Japanese army. The Japanese army issued occupation currencies to replace currency board notes. Much as people in many developing countries hold foreign notes today, the inhabitants of the occupied territories continued to hold currency board notes during the war. The foreign reserves of the currency boards were kept safe in the reserve countries, Britain and the United States. The occupation currencies experienced extreme inflation and became almost worthless. After the war, Britain re-established rule over Hong Kong and Malaya, and the United States re-established rule over the Philippines. The British and American authorities re-opened the local offices of the currency boards quickly as part of an overall economic strategy of replacing wartime command economies with the market economies that had existed before the war. The currency boards resumed full convertibility into their reserve currencies from the day they re-opened (King 1957: 23, 109).

Bank failures have been minor in orthodox currency board systems. Fixed exchange rates with a reserve currency have encouraged foreign commercial banks, especially those based in the reserve country, to establish branches. Their multinational branch networks have enabled them to diversify risk. Domestic banks have had to be strong to survive competition from the foreign banks. Only some small commercial banks have failed in orthodox currency board systems, and the losses they have inflicted on depositors have been tiny. The recent currency board-like systems, which inherited banking systems made fragile from bad monetary policy under central banking, have suffered significant bank failures; however, the failures and their effects have been no worse than those in neighboring central banking systems.

The full convertibility inherent in the currency board system has resulted in capital flight from some currency board systems during periods of economic or political uncertainty. However, capital flight in currency board systems seems to have been small compared capital flight in central banking systems where the threat of foreignexchange controls has existed. Currency board systems have experienced severe shocks to their real exchange rates, but so have central banking systems. Central banking appears on average to have been no more successful than the currency board system in alleviating shocks to real exchange rates or other real prices in the economy, although no systematic study of evidence on the subject exists. An important element encouraging economic growth in currency board systems has been that full convertibility has encouraged foreign investors to take advantage of opportunities for profit during economic downturns. Foreign investment has helped alleviate shocks to the real exchange rate and other real prices in currency board systems.

Despite the economic success of currency board systems, national governments converted most currency boards into central banks in the late 1950s and the 1960s. Some governments were influenced by theoretical arguments that a central bank could promote economic growth better than a currency board. The arguments seemed compelling at the time, but now appear wrong. More important than theoretical arguments against the currency board system were political factors. Newly independent countries established central banks because of the association of the currency board system with colonial rule, and because older, more established countries had central banks. A central bank was a symbol of independence, like a national flag. Politicians in some newly independent countries may also have understood the political advantages of politicized central banks.

The results of central banking in former currency board systems have been lackluster. On average, inflation has been higher and economic growth has been lower in central banking systems than in the currency board systems they replaced, lower than in their former reserve countries, and lower than in the remaining currency board systems (Schuler 1992b: 202-3). Most central banks that have replaced currency boards have restricted the convertibility of their currencies.

Overall, then, the historical record of currency boards and currency board systems has been good, as measured according to several of the most important criteria that economists use. The characteristics we have described as typical of a currency board really have been typical. The actual performance of currency boards has been close to the ideal they have been established to strive for, namely, to maintain full convertibility into the reserve currency at a fixed exchange rate according to strict rules of procedure. Historical experience supports the claim that currency boards, if established according to similarly strict rules in the manner described in the next two chapters, have a high probability of success.

Currency boards and currency board-like systems today

When we wrote the original version of this study in 1994, currency boards had only recently re-emerged from a decades-long period of obscurity during which they were unknown to the public and even to economists specializing in monetary matters. The 1990s saw a number of countries establish new currency boards or currency board-like systems. By far the best-known case was that of Argentina, which existed from 1991 to 2002 and which we discuss briefly below. The other cases that attracted attention were Eastern European countries where currency board-like systems were part of the transition from a centrally planned economy to a market economy. Estonia, which established its system in 1992, replaced its national currency with the euro at the start of 2011. Lithuania, which established its system in 1994, is on track to replace its national currency with the euro at the start of 2015. Bosnia and Bulgaria, both of which established their systems in 1997, continue with them today. We were involved with most of the cases in the 1990s as original proposers of currency boards; Steve Hanke also served as an adviser in Argentina, Bosnia and Herzegovina, Bulgaria, and Lithuania.

Currency boards exist today (2014) in several other places listed in Figure 3.13. The best-known case is that of Hong Kong. Hong Kong's long-term economic success is well known. It has become one of the world's most prosperous economies despite its lack of natural resources; moreover, it has had relatively low inflation.²⁵

The Eastern Caribbean Central Bank, which serves eight small island countries, has been classified as a currency board by some observers, but we classify it as a central bank that maintains a rigidly pegged exchange rate with the U.S. dollar. Countries that seriously considered currency boards or currency board-like systems but did not establish them include Ecuador, El Salvador, Montenegro, and Indonesia (Culp, Hanke, and Miller 1999, Bogetic and Hanke 1999, and Hanke 1998).

Most of the systems established in the 1990s were currency board-like rather than orthodox currency boards. Currency board-like systems differ from orthodox currency boards with respect to their reserve

²⁵ Hong Kong's system has long contained certain deviation from an orthodox currency board system; see Culp and Hanke (2014), Schuler (1998), and Walters and Hanke (1992).

ratios and their power to act as lenders of last resort. None of the currency board-like systems have a maximum reserve ratio. For an orthodox currency board, if it is allowed to accumulate foreign reserves exceeding 100 percent of the monetary base, the amount of the surplus has a definite upper limit, which historically has usually been 10 percent. The purpose of the surplus reserves is to guarantee that reserves are always at least 100 percent by providing a cushion against losses in the securities the currency board invests in. An orthodox currency board is not allowed to use the surplus in a discretionary manner, and all profits beyond those necessary to maintain the small surplus go to the government. Most of the currency board-like systems, in contrast, are allowed to accumulate surplus reserves indefinitely from their profits (though in practice there is political pressure to contribute some reserves to the general government budget). The currency board-like systems are also allowed to use their surplus reserves in a discretionary manner to act as lenders of last resort to commercial banks. In some cases they can also use their main reserves in the same manner: the Bulgarian National Bank is explicitly allowed by law to act as a lender of last resort in case of a crisis affecting the banking system as a whole.

Figure 3.13. Currency boards today (2015) and in the recent past

Country	Population	GDP (US\$)	Dates	Exchange rate / remarks
Argentina ²⁶	43 mn	927 bn	1991-2002	1 peso = US\$1 / Collapsed in crisis
Bermuda	70,000	5.2 bn	Since 1915	Bermuda \$1 = US\$1/Loose capital controls
Bosnia	3.9 mn	38 bn	Since 1997	1.95583 convertible markka = 1 euro**
Brunei	429,000	32 bn	Since 1952	Brunei \$1 = Singapore \$1
Bulgaria	7.2 mn	124 bn	Since 1997	1.95583 leva = 1 euro**
Cayman Islands	56,000	2.5 bn	Since 1972	Cayman \$1 = US\$1.20
Djibouti	828,000	2.5 bn	Since 1949	177.72 Djibouti francs = US\$1
Estonia	1.3 mn	36 bn	1992-2010	15.6466 kroons = 1 euro**/Now uses euro
Falkland Islands	3,400	165 mn	Since 1899	Falklands £1 = £1 sterling
Gibraltar	29,000	1.9 bn	Since 1914?	Gibraltar £1 = £1 sterling
Guernsey	66,000	3.4 bn	Since 1980s?	Guernsey £1 = £1 sterling
Hong Kong	7.1 mn	401 bn	Since 1983	Hong Kong \$7.80 = US\$1
Isle of Man	88,000	4.0 bn	Since 1961?	Manx £1 = £1 sterling
Jersey	97,000	5.8 bn	Since 1963?	Jersey £1 = £1 sterling
Lithuania	2.9 mn	79 bn	1994-2014	3.4528 litas = 1 euro** / Now uses euro
Macau	593,000	52 bn	Since 1999*	1.03 patacas = Hong Kong \$1
St. Helena	7,800	31 mn	Since 1976	St. Helena £1 = £1 sterling

*Earlier de facto. **Initially fixed to German mark (Bosnia, Bulgaria, Estonia) or U.S. dollar (Lithuania).

Some of these systems are or have been less than orthodox.

GDP is evaluated at purchasing power parity. GDP estimates for some very small jurisdictions are old.

Sources: *CIA World Factbook* (2015), authors.

²⁶ We include Argentina on this list only because it is commonly thought to have been a currency board. That said, we have written extensively on why Argentina was not an orthodox currency board: Hanke (2003c), Hanke (2008), and Hanke and Schuler (2002). We also warned in October 1991, shortly after Argentina's "convertibility" system was installed, that it would encounter trouble, if not made orthodox (Hanke 1991).

We have been on the whole pleasantly surprised by the good performance of the currency board-like monetary authorities, which have acted more like currency boards than like central banks, and have provided sound currencies. In all cases, inflation has fallen dramatically and economic growth has been positive—quite a contrast with the experience of those countries under central banking. We see a potential problem with the currency board-like systems, though, because they are a compromise between the discipline of orthodox currency boards and the desire of governments to retain some discretion in monetary policy, particularly the ability to have a lender of last resort. Discipline and discretion are incompatible elements, and often when they clash under central banking it is discipline that is sacrificed.²⁷

The gigantic exception to the good performance of the currency board-like systems is Argentina. Argentina established its system, known locally as “convertibility,” in 1991 during a hyperinflation. The system quickly reduced inflation to low levels and created momentum for other reforms that restored economic confidence, restarting growth. From the start, the convertibility system had certain loopholes (Hanke 1991). In 1995 Argentina suffered a financial crisis spilling over from Mexico’s crisis of late 1994, but the convertibility system endured with the help of some confidence-boosting measures. In 1998 Argentina entered a recession that later became into a depression. External conditions were unfavorable, with financial crises in a number of large emerging markets, including Argentina’s largest trading partner, Brazil. Prices for Argentina’s major commodity exports fell substantially. Domestic conditions were also unsettled, with a change of government to a coalition not initially seen as strongly committed to preserving the exchange rate, a series of damaging tax increases during recession, and a failure to place government finances on a path that would be sustainable for the long term (Hanke 2000c). In 2001 the situation grew increasingly severe the likelihood grew that the government would default on its foreign debt. The government undertook a series of desperate measures that failed to restore confidence; in fact, risk spreads in interest rates rose substantially, hurting the chances for renewed growth. The measures the government took included some changes to the convertibility system that moved in the direction of greater discretionary policy, rather than currency board orthodoxy. The financial system underwent a crisis in late 2001 and early 2002 that led to a political upheaval, the floating of the Argentine peso and the end of the convertibility system, a default on government debt, and other changes to the economic policies of the 1990s. After a further contraction in early and mid-2002, the Argentine economy started growing, aided substantially by a long boom in world commodity prices that boosted the value of its exports. After a decade, the new policies began showing signs of problems themselves, and are currently under debate within Argentina and abroad concerning their continued chances of success.

We wrote in a number of places, including the original 1994 version of this study, of our concerns about the potential weaknesses of Argentina’s system, arising in our view from its unorthodox features. In early 1999, long before the system spiraled into crisis, we wrote a plan for dollarizing, which Steve Hanke presented to then-president Carlos Menem (Hanke and Schuler 1999; see also Hanke 1999a). Our proposal included elements that Ecuador successfully used to end an economic crisis less than a year later. The Argentine case has been the subject of intense but often ill-informed debate that neglects

²⁷ For a review of some of the major issues see Hanke (2000b, 2002a and 2002d)

basic facts about how the system operated. This is not the place for a long rehash of the debate, so we direct readers who want to know the details about Argentina to Hanke (2002b, 2002c, 2003c and 2008) and Schuler (2003, 2005). For information about other currency boards and currency board-like systems, readers may wish to consult the extensive bibliography compiled by Gross, Heft, and Rodgers (2012), which lists country names as keywords.

We wish continued success for the remaining currency board-like systems, but think that they would have greater credibility and durability if they became orthodox currency board systems. We also stress the need for economists and other observers to distinguish carefully between orthodox currency boards and currency board-like systems, which most have not done (for example, Baliño, Enoch and others 1997, Roubini 1998, Williamson 1995).

4. HOW TO ESTABLISH A CURRENCY BOARD

A currency board can be established by converting the central bank into a currency board or by making the currency board the issuer of a parallel currency alongside the central bank. Both approaches have been used by past currency boards. This chapter explains both approaches step by step.

How to convert a central bank into a currency board

If a government wishes to convert a central bank into a currency board, how should the government proceed?

Experience with currency boards in places as diverse as Palestine, Danzig, and the Philippines indicates that administratively, converting a central bank into a currency board system is simple. The steps for conversion are as follows.

1. Delegate to other bodies all functions of the central bank other than supplying the monetary base. For instance, the ministry of finance can regulate commercial banks and give advice to the president on monetary affairs. Commercial banks can operate the payments system and provide mutual deposit insurance protection.

2. Allow a brief period of clean, unrestricted floating exchange rates for the domestic currency. The exchange rate between the reserve currency and the domestic currency must be appropriate. An overvalued real exchange will price exports out of world markets, while an undervalued real exchange rate will make imports expensive, preventing people from buying foreign machinery and other goods needed for modernizing national economies. The best indication of the appropriate real exchange rate is the unrestricted market rate, which reflects supply and demand. Accordingly, the first step in fixing an exchange rate for the domestic currency is to allow the exchange rate to float for a brief period.

When the government allows the domestic currency to float without restrictions, it should announce its choice of reserve currency and the date it will fix the exchange rate. The reason for making the announcement is to reduce uncertainty that otherwise may tend to undervalue the domestic currency as a store of value. A period not exceeding 90 days should be sufficient to indicate approximately the appropriate exchange rate. The float should be a clean one reflecting market forces only, rather than a dirty float reflecting intervention by the central bank. To promote a clean float, all existing foreign-exchange regulations should be abolished.

3. Make the actions of the central bank transparent and predictable. During the period of unrestricted floating, the actions of the central bank should be transparent and predictable, so that they cause no destabilizing random surprises to exchange rates. The central bank should be required to disseminate weekly or even daily reports of its activities and its balance sheet. Another way of making the actions of the central bank more transparent and predictable is to require that it hold significant reserves against further increases in the monetary base. For instance, it can be required to increase its foreign reserves by 100 per cent of any increase in the monetary base that occurs after the government announces the monetary reform.

4. *Convert some required reserves of commercial banks (deposits at the central bank) into currency board notes and coins or into foreign securities, whichever the commercial banks prefer. Dispose of remaining reserves.* With this step, the deposit liabilities of the central bank will cease to exist. If the central bank imposes reserve requirements on commercial banks, not all deposits of commercial banks at the central bank will necessarily be converted into currency board notes and coins or into foreign securities. "Excess" reserves can be converted into government bonds to avoid creating inflation. A later section in this chapter discusses what quantity of reserves commercial banks may need and what proportion of reserves is excess.

5. *Establish a fixed exchange rate with the reserve currency.* After the deposit liabilities of the central bank cease to exist, all that will remain are its issues of notes and coins in circulation and its net worth, on the liability side of the balance sheet, and its foreign reserves and miscellaneous holdings such as its offices, on the asset side. Its other assets and liabilities will have been distributed to commercial banks or the government, or will have been canceled. To convert what remains of the central bank into a currency board, the government must now establish a fixed exchange rate with the reserve currency it chose in step 2. Simultaneously, the government must ensure that reserve assets for currency board notes and coins in circulation equal 100 per cent.

When the date to establish the fixed exchange rate arrives, the government should set the rate somewhere within the range of recent market rates. Setting exchange rates is an art rather than a science; if uncertainty exists about an appropriate exchange rate, it is best to err on the side of an apparent slight undervaluation rather than a slight overvaluation compared to the range of recent market rates, so as to be certain that the exchange rate does not price exports out of world markets. It is better to start with an exchange rate that results in competitively priced exports than with an exchange rate that results in overpriced exports. As Hong Kong's experience in returning to the currency board system in 1983 illustrates, a range of freedom exists in setting an exchange rate (see Greenwood 1983b). As long as the new rate is credible and not deliberately undervalued or overvalued grossly, the economy will quickly tend to make the minor adjustments necessary to accommodate the new exchange rate. An alternative way of setting the exchange rate is to set it immediately, without a period of floating, at an estimate of the market-clearing rate or at a deliberately undervalued rate. That method seems disadvantageous because it makes no attempt to gather information from the market.

Some economists distrust the ability of a float, even a clean float, to indicate approximately the appropriate exchange rate. They would prefer to use statistical constructs for setting the exchange rate (Williamson 1992: 43-4). But there is no reason to think that using statistical constructs to set the exchange rate would be any more successful than using statistical constructs to centrally plan other economic activities. Such measurements often have no direct connection to supply and demand.

6. *Ensure that foreign reserves equal 100 per cent of domestic-currency notes and coins in circulation.* The currency board should begin with foreign reserves equal to 100 per cent of its notes and coins in circulation. (If the currency board accepts deposits, foreign reserves should equal 100 per cent of notes and coins in circulation plus deposits.) Allowing the currency board to operate with a lower reserve ratio might create possibilities for the board to administer a discretionary monetary policy.

7. *Transfer the remaining assets and liabilities of the central bank to the currency board and open the currency board for business.* At the moment that the government fixes the exchange rate with the

reserve currency, the currency board will replace the central bank as the issuer of domestic notes and coins and will assume all remaining assets and liabilities of the central bank. The central bank will cease to exist. We envision all the steps being completed within 120 days of the decision to establish a currency board. They could take as little as 30 days. Historical experience has been that monetary reform is usually most successful at encouraging economic recovery when enacted quickly (see Yeager and others: 42-3).

The alternative: a parallel currency approach

Attempts to convert a central bank into a currency board may encounter political opposition. The central bank and state enterprises dependent on it for subsidized loans often have considerable political power and may oppose monetary reform. Converting the central bank into a currency board may suddenly deprive state enterprises and the government of access to inflationary finance, causing them hardship as they adjust to hard budget constraints. Is there a way to bypass the potential political obstacles posed by entrenched political interests and to ease the transition from high inflation to low inflation?

Establishing a currency board as an issuer of a parallel currency may do so, although it is not a tactic that has often been used. To reiterate, a parallel currency is one that circulates extensively alongside another currency at exchange rates determined by market forces. The parallel currency can have a fixed, pegged, or floating exchange rate with the other currency, and can circulate legally or illegally.

Parallel currencies have been common historically. Many countries have had parallel circulation of gold and silver or silver and copper coins (bimetallism). Some have also had parallel circulation of, say, gold notes and deposits with silver notes and deposits. Today, parallel currencies are common in many border regions; for instance, the U.S. dollar and the Canadian dollar both circulate along the U.S.-Canadian border, although the U.S. dollar predominates in the United States and the Canadian dollar predominates in Canada. Gasoline stations, stores, and commercial banks near the border accept both currencies, as they are legally allowed to do. The exchange rate between the U.S. dollar and the Canadian dollar is floating, though in the past it has also been fixed or pegged. Parallel currencies are also common in countries that have had extreme inflation and inconvertible currencies, such as Russia. The U.S. dollar and other relatively stable foreign currencies are illegally used by the public in preference to the domestic currency. This is called currency substitution or dollarization.²⁸ In many developing countries today, the U.S. dollar is a widely used parallel currency. At least in unofficial markets, it often floats against the domestic currency.

Parallel currencies have a long history, then, and are part of the experience of residents of many countries today. What may be new to readers is the explanation here of how a currency board issuing a parallel currency can reform a monetary system. In the system of parallel currencies proposed here, the currency board currency will circulate alongside the central bank currency as an alternative, officially approved domestic currency. There will therefore be two competing domestic currencies. Competition from the currency board will force the central bank either to provide a currency of comparable high

²⁸ For recent articles on currency substitution, see *Revista de análisis económico* (1992).

quality to the currency board currency, or to wither away as people cease to use the central bank currency.²⁹

Many economists oppose proposals for legalizing a parallel currency (Cooper 1991a: 131-2, 1991b: 312-14; Nuti 1991: 54-5; Williamson 1991: 402-4). Their criticisms do not apply to a currency board as a parallel issuer, though. The main criticism of legalizing a parallel currency is that it would accelerate inflation in the central bank currency. The central bank currency continues to be used in many countries mainly because it has the support of the domestic government, in the form of forced tender laws, which make its use compulsory. Granting equal legal status to the currency board currency would supposedly reduce the incentive for holding the central bank currency. Accordingly, some people would cease holding central bank currency and instead would hold currency board currency. As demand for the central bank currency diminished, inflation in the central bank currency would increase (the velocity of the central bank currency would increase) unless the central bank reduced the monetary base of the central bank currency. For political reasons, reducing the monetary base would be difficult. Inflation in the central bank currency would therefore accelerate, causing a self-reinforcing cycle of further reductions in demand for the currency board currency. Ultimately the cycle would end in hyperinflation in the central bank currency, which would deprive the government of seigniorage from the central bank currency and cause economic decline.

The criticism is flawed. It assumes that people in countries with unsound currencies currently use the central bank currency as their only currency. In reality, those countries typically already have one or more parallel currencies, such as the U.S. dollar, and many parallel stores of value besides. Many residents already hold foreign notes at home and some have foreign-currency deposits abroad. In some countries, people also hold durable goods such as bricks and soap. Therefore, the choice in such countries is not between a situation with a single currency and a situation with a parallel currency, but between two situations with parallel currencies. The only question that remains to be decided is whether a parallel currency will circulate illegally alongside the central bank currency, as the U.S. dollar and other foreign currencies now do, or legally, as the currency board currency will in this proposal.

It is not certain that the existence of a parallel currency board currency will reduce demand for the central bank currency, even if the central bank continues to increase the monetary base of the central bank currency as rapidly as before. In many cases, legalizing a parallel currency has had the consequences that critics fear, but that need not always be the case. By encouraging remonetization of the economy by means of domestic currency, a sound parallel currency issued by a currency board may actually increase demand for the central bank currency (Auerbach and others 1992: 19-23; Rostowski 1992: 95-6; Rostowski and Shapiro 1992: 17, 29). (Ultimately, though, demand for the central bank currency will diminish toward zero if the central bank does not use the opportunity provided by an increase in demand to stabilize the value of its currency.)

Suppose, however, that the existence of the currency board currency reduces demand for the central bank currency, as critics of a parallel currency argue it will. The good domestic currency will tend to displace the bad one in circulation. Inflation in the central bank currency will increase and seigniorage

²⁹ Typical monetary analysis, which relies on the quantity theory of money, does not apply to a system of parallel currencies. On the economics of parallel currencies, see Hayek (1978) and Vaubel (1978). (Earlier, Hayek [1937: 91-2] advocated a type of currency board system.)

from the central bank currency will cease. But the currency board currency will enable the domestic government to recapture some of that seigniorage as well as seigniorage now lost to foreign central banks. More important, the currency board currency will greatly reduce the economic inefficiency caused by an inconvertible currency suffering high inflation. By using the currency board currency, people will be able to avoid the disturbances to economic activity that the central bank currency causes because it is an unsatisfactory medium of exchange, store of value, and unit of account (Auerbach, Davison, and Rostowski 1992: 11-18; Rostowski 1992: 94-101).

Unlike critics of legalizing a parallel currency, we are little concerned with the fate of the central bank currency in a parallel currency approach. If the central bank withers away as an issuer of currency, fine; it will cease to have an effect on the economy, and the economy will benefit. Its remaining functions can be assigned to other government bodies, privatized, or abolished. If competition from the currency board induces the central bank to change its behavior and the central bank currency continues to exist as a less inflationary currency than it is now, that is also fine. In either case, at least one sound domestic currency will exist.

Competition between the central bank currency and the currency board currency will be greatest if both are allowed by law to serve identical functions. If the currency board currency is not at first allowed equal legal tender status with the central bank currency, or if currency board notes and coins are limited to large denominations, the competition will be unequal and demand for the central bank currency will be more than it otherwise would be. To reap the full advantages of the currency board currency as a parallel currency, the government should not limit competition with the central bank currency.

How to establish the currency board as the issuer of a parallel currency

The currency board can be established as the issuer of a parallel currency according to the following steps, which should take no more than 60 days. For example, the currency board that existed in North Russian from 1918 to 1920 was established just eleven weeks after it was first proposed, despite civil war and reliance on less rapid transportation and communications than exist today (Hanke and Schuler 1991a).

1. Obtain initial foreign reserves for the currency board. We describe later how to calculate the quantity of initial foreign reserves necessary for the currency board and how to obtain the reserves.

2. Make the currency board currency legal tender for payment of taxes and private debts. The currency board currency should be made a legally permissible currency in which to pay taxes and private debts. However, that the currency board currency should not be forced tender for private debts, that is, people should be allowed to make contracts and payments in the central bank currency or other currencies if both parties to a contract or payment wish.

3. Issue currency board currency equal to the initial foreign reserves. The currency board will have 100 per cent foreign reserves from the beginning. It will issue no more currency board currency than the value of its foreign reserves.

4. *Put the currency board currency into circulation, for example, by a distribution to every inhabitant of the country according to a well-defined plan.* The nominal exchange rate between the reserve currency and the currency board currency can be anything, so long as the real amount of currency board currency does not exceed the foreign reserves of the currency board. Suppose that the reserve currency is the U.S. dollar and that the currency board has \$100 million of foreign reserves. The currency board will issue 100 million units if the exchange rate is one currency board unit per dollar, or 500 million units if the exchange rate is five currency board currency per dollar. In either case, the amount of currency board currency issued equals \$100 million. An exchange rate of one to one seems best, because it will make conversions easiest to calculate.

The currency board will now inaugurate the parallel currency system by distributing currency board currency representing up to \$100 million. The actual distribution can be designed in various ways. An easy method is to give every resident an equal amount of currency board notes and coins as a one-time gift. The currency can also be given on a per household basis, or according to various scales: for example, a certain amount for the first person in each household, a lesser amount for each additional adult, and a still lesser amount for each child.

To prevent fraud, the government can take precautions similar to those used to prevent voting fraud. Residents who receive their distribution of currency board currency can have their identity documents stamped or their fingers dipped in indelible ink. The distribution of currency board currency should occur simultaneously throughout the country over a short period.

5. *Allow the currency board currency to circulate as a parallel currency to the central bank currency, at an exchange rate determined by market forces.* After the previous steps have been taken, the currency board currency will circulate alongside the central bank currency. Nobody will be forced to use the currency board currency. Much of the domestic economy will use the currency board currency as the medium of exchange, store of value, and unit of account because the currency board currency will be more stable than the central bank currency. It will be a matter for individuals to decide whether they now wish to pay and accept currency board currency or central bank currency. Commercial banks will also have to decide whether to allow depositors to convert existing deposits in central bank currency into currency board currency.

This proposal assumes that there will be an unrestricted market in exchange, so that people can exchange any amount of central bank currency for currency board currency or the reverse at the market rate. Hence it will be no disadvantage, in terms of the function of either type of currency as a medium of exchange, to be paid in one type of currency or the other.

The central bank will have to make its currency sufficiently sound to withstand competition from the currency board currency or it will wither away in importance as an issuer of currency. We suggest that when the real value of central bank notes and coins diminishes to less than 10 per cent of all domestic currency in circulation, the central bank should be abolished. By then the political forces supporting the central bank should be weak.

If currency board currency is introduced by distributing it to the public, the government will for a time continue to make payments in central bank currency, because it will have no currency board currency. If the government wishes to receive currency board currency in tax payments, it must ensure that

accounting rules do not favor central bank currency, for example by not taking into account the decline in the real value of a given nominal amount of central bank currency between the time taxes are assessed and paid. If accounting rules favor the central bank currency, the government may receive no currency board currency.

If the government uses both currencies in payment for a while, and if the central bank currency continues to depreciate, the government will need to devise rules about what combination of currencies it uses. A simple rule is for small payments to consist only of central bank currency, and large payments to consist only of currency board currency. The size of payments considered "large" can decrease to zero as the government accumulates more currency board currency. Persons receiving payments from the government will experience little disadvantage from being paid in central bank currency rather than currency board currency, if the government adjusts its payments to the market exchange rate of the central bank currency against the currency board currency. An unrestricted market will exist for exchanging the two types of currency, so people will be able to exchange their central bank currency immediately if they wish.

How to choose a reserve currency

What reserve currency should the currency board choose? The most likely choices for most countries are the U.S. dollar, the euro, or the Japanese yen, the three key currencies of international trade and finance.

The U.S. dollar is the most widely used currency in international trade and finance. Raw materials, such as oil, natural gas, timber, and minerals, are predominantly priced in dollars on world markets. The dollar also has the advantage that it already is the most widely used unofficial parallel currency and a popular unit of account in many developing countries. Choosing the dollar would involve the least change of habits of any reserve currency in such countries. Historically, the dollar has had low inflation, high credibility, full convertibility, and low real interest rates. It has a high likelihood of continuing its exceptionally good historical performance.

The euro is another possible reserve currency. It is the currency of Western Europe, the largest trading partner and largest potential source of new foreign investment for countries in Eastern Europe, the former Soviet Union, and Africa. It is unclear whether the euro will perform as its most important predecessor, the German mark has, but even if the euro only performs as well as the average Western European currency, that will still be better than the performance of the performance of the currencies of 90 percent or more of developing countries.

The Japanese yen is less widely used in international trade or as a parallel currency than the dollar or the mark. Even so, Japanese trade and investment from Japan have since the 1980s become important in many countries, particularly those in Asia. The yen has had low inflation since the mid 1970s and has a relatively good long-term record of stability also.

A basket of foreign currencies does not seem advantageous as the reserve currency for the vast majority of potential currency boards. A basket is less transparent to the public than a single reserve currency, and thus may not as quickly achieve high credibility for the currency board. A basket also imposes greater costs on the currency board in terms of management time and transaction fees. A basket does

not eliminate exchange risk with any single reserve currency; it sacrifices greater potential variability of exchange rates with each component of the basket for lower variability with the whole basket. If people are allowed to hold foreign-currency deposits, those who desire the benefits of lower variability with a basket of currencies can create their own baskets by holding a combination of currencies or by trading currency futures and options, as people do in Hong Kong.

We have considered the implications for developing countries of choosing various reserve currencies. It is also worthwhile to consider the implications for the reserve country. If the reserve currency is already widely used as a parallel currency, the demand for reserve-currency notes will probably decrease because people will exchange reserve-currency notes for currency board currency notes and coins. On the other hand, commercial banks will demand more reserve currency, either directly or through correspondent banks in the reserve country, as a means of settling payments.

The net effect of a currency board currency on demand for the monetary base of the reserve currency is thus unclear in this case. Whatever the case, the economies of most developing countries are small compared to the U.S., euro zone, and Japanese economies, so the initial effect of a currency board choosing the dollar, euro, or yen as the reserve currency will be correspondingly small.

Linking the currency board currency to a foreign currency does not subject a country to foreign political domination. Rather, linking the currency to an appropriate foreign currency can restore an element of national pride by giving a country a currency as sound as the reserve currency.

The next chapter suggests what the currency board should do if the reserve currency becomes unstable.

How to calculate the initial foreign reserves

What quantity of initial foreign reserves will the currency board need? The answer partly depends on how the board is established. If the central bank is converted into a currency board, the entire domestic monetary base will require 100 per cent foreign reserves as backing. If the currency board is the issuer of a parallel currency, the initial foreign reserves can be smaller.

Suppose first that the central bank is converted into a currency board. The foreign reserves that the currency board system needs will depend on the size of the monetary base and the exchange rate with the reserve currency.

The monetary base typically comprises currency notes and coins in circulation (whether held by commercial banks or the public) and deposits of commercial banks at the central bank. Currency notes and coins in circulation should be backed 100 per cent by foreign reserves in the currency board system. As was explained earlier in this chapter, not all currency reserves of commercial banks need be converted into currency board notes and coins or foreign securities, although those that are should be backed 100 per cent by foreign reserves. The usable reserves of commercial banks are those in excess of minimum required reserves. Therefore, for example, if the reserve requirement is 20 per cent, a commercial bank with 25 per cent reserves has only usable reserves of only 5 per cent of the public's deposits with it.

In the currency board system, the government should impose no reserve requirements. Commercial banks should determine their own reserve ratios according to their judgments of what is prudent, as has been the case in most past currency board systems. In modern banking systems with no reserve requirements, commercial banks have usually held reserves of only a few per cent of deposits. The primitive condition of banking technology in many developing countries may at first make it necessary for domestic commercial banks to maintain higher reserve ratios than banks in modern banking systems with no legal reserve requirements. To provide domestic commercial banks with reserves that are more than adequate, suppose that the banks need reserves of 10 per cent of deposits. (These are reserves that they will have after being restructured, if necessary.) The actual ratio to be used will vary from case to case. Since according to this proposal no reserve requirement for commercial will exist in the currency board system, all the reserves of commercial banks remaining after monetary reform will be usable reserves. Allowing all current reserves of commercial banks to become usable reserves in the currency board system might risk causing renewed inflation, though, because half or more of current reserves might be excess, not needed by the banks to ensure convertibility of their deposits into currency board notes and coins. The excess reserves would become the basis for an increase in bank loans and hence an increase in prices of domestic goods similar to that indicated in Figure 3.2. The economy would eventually achieve a new set of higher, market-clearing prices, but in the meantime inflation would have undesirable effects.

If the central bank is converted into a currency board, the quantity of initial foreign reserves necessary for the currency board system is the sum of currency notes and coins in circulation plus 10 per cent of currency deposits (the somewhat arbitrary but quite adequate figure discussed earlier), divided by the exchange rate of currency per unit of reserve currency. Deciding what exchange rate to use in the calculation is difficult in many cases because no legal unrestricted market for currency exists. Little can be said in general about the appropriate exchange rate. However, we stress that whatever rate is used, the calculation will be merely an estimate. The actual amount of reserves necessary will be determined by the exchange rate attained during the brief period of floating before the exchange rate with the reserve currency is fixed.

If the currency board is established as the issuer of a parallel currency, in contrast, no determinate quantity of initial foreign reserves is necessary, because the currency board will not provide backing for the monetary base of the central bank currency. All notes and coins of the currency board in circulation must be backed 100 per cent by foreign reserves, but the board can begin with whatever initial quantity of foreign reserves it obtains. The initial quantity of foreign reserves should be sufficient to indicate to the populace that the currency board is a substantial institution. Notice that in the parallel currency approach, commercial banks are given none of the initial foreign reserves. If they wish to offer deposits in currency board currency, they need to acquire currency board currency notes and coins or reserve-currency assets as reserves.

How to obtain the initial foreign reserves

Once the quantity of initial foreign reserves the currency board needs has been calculated, how can the currency board obtain the reserves?

In the conversion approach, the net amount of foreign reserves the currency board will need will be the gross amount minus existing foreign reserves. In the parallel currency approach, the net amount of

initial foreign reserves the currency board will need will equal the gross amount, because the central bank will continue to exist and the currency board will obtain no reserves from the central bank.

In either approach, if existing foreign reserves are small, the currency board may need additional foreign reserves to provide backing. Foreign reserves can be obtained from several sources. The government can lease or sell state property for fully convertible foreign currency. Equivalently, if the central bank is converted into a currency board, the government can lease or sell state property for currency and not reissue the currency. (That would be like the process described in Figure 3.13, which decreases the monetary base and the overall supply of money.) A similar technique was used in Slovenia to privatize apartments and to establish the Slovenian tolar as a new currency to replace the Yugoslav dinar. To buy apartments, Slovenes had to pay tolar, and to obtain tolar, they had to exchange foreign currency, such as German marks and Austrian schillings, for tolar. The combined privatization and currency reform brought foreign currency into the Slovenian central bank (Pleskovic and Sachs 1992). Another possible source of reserves is a loan from the International Monetary Fund, which for example in 1997 lent some of the funds necessary to bring the reserves of Bulgarian currency board-like system up to an adequate level. To keep the currency board "pure," its constitution should forbid it from accepting loans other than a loan for its initial foreign reserves.

If the currency board borrows from the IMF, the currency board will eventually have to repay the loan. Even if the currency board has no other initial reserves than the loan from the IMF, the currency board should have no difficulty repaying the loan within fifteen to twenty years. Because the currency board will issue a sound currency, people will tend to exchange the foreign notes that they now hold, and hold currency board notes and coins instead. Because the currency board will help the economy to grow, the overall demand for domestic currency will increase. Consequently, the note and coin circulation of the currency board will increase from its initial level, its foreign reserves will increase accordingly, and the seigniorage from the foreign reserves will increase. Based on historical and current international comparisons of the relationship between income and circulation of notes and coins,³⁰ the note and coin circulation of the currency board will probably equal at least 3 per cent of GDP within three years after the currency board opens. If the net seigniorage the currency board earns is 4 per cent of its note and coin circulation, the currency board should be able to repay at least 0.12 per cent of GDP a year to the IMF. These are conservative estimates that many countries may exceed.

Once the currency board opens, the self-adjusting nature of the money supply process in a currency board system will enable the money supply to accommodate changes in demand for money. Experience indicates that the currency board system has not hindered rapid increases in the money supply that have been justified by economic growth. Foreign investment has enabled the money supply in currency board systems to increase consistently despite decades of current-account deficits. It is worthwhile to consider a point previously mentioned that applies only to the conversion approach, not to the parallel currency approach. Suppose that the impending conversion of the central bank into a currency board increased the credibility of the currency so much that during the brief period of floating exchange rates (step 2 of the parallel currency approach), the exchange rate of the currency appreciated compared to the previous rate, and the foreign reserves necessary for the currency board system therefore increased substantially.

³⁰ See Bordo and Jonung (1987: Appendix) and the IMF's *International Financial Statistics*.

In that case, the very success of the monetary reform would enable the government to acquire the necessary additional reserves. The appreciation in the exchange rate of the currency would reflect increased confidence in the economy. Increased confidence will increase the capitalized value (present value) of assets in the country. Increased confidence in the economy should enable the government to obtain even a large quantity of initial foreign reserves for the currency board by taxation or by borrowing. In practice, lack of initial foreign reserves has not been a problem for any currency board or currency board-like system. Where the reserves have not been sufficient at the start, it has been possible to augment them by borrowing them or securing lines of credit, and the rapid growth in the monetary base that has occurred as a result of confidence in the currency has generated the seigniorage to repay borrowed reserves.

5. HOW TO OPERATE AND PROTECT A CURRENCY BOARD

How to operate a currency board

A typical currency board is simple to operate. Past currency boards have usually had staffs of ten or fewer people. Past currency boards have achieved economies by contracting clerical and investment functions to outside parties; a new currency board can do likewise. The extreme simplicity of a currency board is one of the advantages of the currency board system. As has been mentioned, many central banks in developing countries lack staff with the technical skill to administer monetary policy competently. The main administrative details of operating a currency board will be as follows.³¹

Constitution: The Appendix contains a model currency board law that distills features of past currency board constitutions into a form that should enable the currency board to operate efficiently. Exchange policy: The currency board will exchange its notes and coins on demand at a fixed rate into or from the reserve currency at its offices or agencies. Anybody who has reserve currency will be able to exchange it for currency board notes and coins at the fixed rate, and anybody who has currency board notes and coins will be able to exchange them for reserve currency at the fixed rate. To hold a large supply of reserve-currency notes would reduce the profits of the currency board, because the board would be unable to invest those funds in interest-bearing securities. Hence, the currency board should try to encourage a "wholesale" currency exchange business with commercial banks and use electronic funds transfer extensively for payment and acceptance of reserve-currency securities. Clientele: Although the currency board should encourage a wholesale currency exchange business with commercial banks, the public should also be allowed to deal directly with the currency board. Some British colonial currency boards dealt only with banks, as a way of reducing their need for staff (Greaves 1953: 13). It seems unnecessary and unjust to discriminate against the public so. Most people will exchange currency through commercial banks in any case, as the West African Currency Board discovered when it changed from dealing with commercial banks only to dealing with the public also. Giving the public the choice of dealing directly with the currency board will place a low limit on the commission fees that commercial banks charge for exchanging currency board currency for reserve currency. That will tend to tighten the link between the currency board currency and the reserve currency, which will make arbitrage between the currency board country and the reserve country more efficient.

Lower and upper limits to exchanges: To reduce their handling costs, many currency boards have imposed minimum exchange amounts. Small British colonial currency boards such as those of Jamaica or Barbados required a minimum of £1,000; larger ones such as the West African Currency Board required a minimum of £10,000 ones such as the West African Currency Board required a minimum of £10,000 (Greaves 1953: 13). To strengthen confidence, a currency board established according to the proposal here should impose no minimum. The public will then know that the currency board is always ready to convert any amount of currency board currency into reserve currency. There will also, of course, be no upper limit to the amount of reserve currency or of its own notes and coins in circulation that the currency board accepts for exchange. No past currency board except that of Bermuda has ever had an upper limit to exchanges, because an upper limit restricts the full convertibility into the reserve currency that is the purpose of the currency board system.

³¹ For more details on the operations of past currency boards mentioned in this chapter, see Schuler (1992b).

Commission fees: Some currency boards have charged commission fees of 1/8 per cent to 1 per cent per transaction; the North Russian currency board, for instance, charged a fee of 1 per cent. Other boards have charged lower commission fees for large transactions than for small ones. We recommend that a currency board established according to the proposal here charge no commission fees for exchanges. The social benefits of not charging fees greatly exceed the pecuniary benefits to the currency board of charging fees. Commission fees would loosen the link to the reserve currency, especially for short-term capital movements, because they would impose high costs relative to the benefits of arbitrage. A few currency boards, most notably the East African Currency Board toward the end of its existence, have deliberately manipulated their commission fees to influence capital movements (Kratz 1966: 246-7). But a currency board is intended to eliminate exchange risk with the reserve currency, so it is pointless to erect barriers to exchange into and from the reserve currency. Besides, commission fees would bring little income to the currency board; it will in any case earn most of its income from interest on its foreign assets. Exchanges by the currency board should be exempt from taxation, to prevent the government from attempting to tax the currency board out of existence. The currency board should also be exempt from other legal barriers that might hinder exchanges by it.

Offices: The currency board should have its main office in the financial center of the country. It should have a few branch offices or agencies in other large cities, if the country is large. The main office will do most of the business. The main role of the branch offices or agencies will be storing and distributing notes and coins. The currency board need not have actual branches. Instead, one or more commercial banks can be the board's agent outside the financial center, as the Bank of British West Africa was for the West African Currency Board. The currency board should also have an office abroad, in the reserve country or in a safe-haven financial center such as Switzerland. The office abroad will provide a backup location for redeeming notes and coins should the government threaten to harass the domestic offices of the currency board.

Management: The currency board should have a small board of directors to supervise the board's staff. Past currency boards have had three to eight directors. The powers of the board of directors and of the staff will be limited; unlike their counterparts in central banks, they will have no discretionary control of the monetary base. To protect the board of directors from political pressure to convert the currency board into a central bank, directors should have staggered terms. Also, some directors could be foreigners, appointed by foreign commercial banks, or perhaps by the International Monetary Fund if the IMF lends some of the initial foreign reserves of the currency board. The next section returns to this proposal.

Staff: The staff of the currency board will perform two functions: exchanging currency board notes and coins for reserve currency, or the reverse, and investing the assets of the currency board in low-risk securities denominated in and payable in the reserve currency. The exchange work will require only a small number of bank tellers. The investment work will require some expert financial traders, but since the currency board will follow rather routine, conservative investment practices, its investment expenses should be smaller than those of commercial banks with portfolios of similar size. The assets of the currency board should be held at suitable institutions abroad, for example with one or more large foreign commercial banks or central banks. Past currency boards have had small staffs. The West African Currency Board, which served Nigeria, the Gold Coast (Ghana), Sierra Leone, the Gambia, Camerouns, and Togoland, had only one full-time employee at its London headquarters (Loynes 1962: 18). It and

other currency boards contracted their exchange and investment work to commercial banks or other agents. The new currency board can do the same if that is more efficient than hiring its own staff.

Reserve ratio: The currency board will begin with foreign reserves equal to 100 per cent of its notes and coins in circulation. In addition, like most past currency boards, the currency board should accumulate a reserve fund to ensure that its foreign reserves are never less than 100 per cent even if its assets lose part of their market value (for example, if interest rates increase, reducing the principal of fixed-rate securities). Many currency boards have accumulated a reserve fund of 10 per cent of notes and coins in circulation (Clauson 1944: 9). They have usually paid all net seigniorage into the reserve fund until the reserve fund is full. They have paid all additional net seigniorage to their governments. These rules leave no opportunity for discretionary monetary policy when the foreign reserves of the currency board are between 100 per cent and 110 per cent. The currency board should adopt similar rules.

Composition of reserves: The currency board should hold its foreign reserves in low-risk assets payable in the reserve currency only. Most of its foreign reserves will be low-risk, interest-earning securities. It can also hold some foreign reserves in interest-bearing deposits at reputable commercial banks in the reserve country, or in reserve-currency notes or noninterest-earning deposits at the central bank of the reserve country. As much as possible, the currency board should avoid holding assets that earn no interest.

The currency board should not hold assets denominated in domestic currency, because that would open the way to central banking-type operations. Specifically, the currency board would be able to increase or decrease the domestic monetary base by changing its holdings of domestic securities, as a central bank does. Allowing holdings of domestic assets was one of the steps that led the East African and Southern Rhodesia currency boards, among others, toward becoming central banks (Kratz 1966: 236-41; Newlyn and Rowan 1954: 67-9). It is desirable to specify in the constitution or bylaws of the currency board what types of assets it may hold.

Besides opening the way for central banking, holding domestic assets can be risky, as the experience of the North Russian currency board shows. The North Russian board held 25 per cent of its reserves in North Russian government bonds. When the Red Army captured North Russia, the North Russian government defaulted on the bonds. The British government, the main holder of currency board notes, lost about 15.5 million rubles as a result (Hanke and Schuler 1991a).

Limiting the currency board to assets payable in the reserve currency need not limit the currency board to securities issued in the reserve country. Many governments and companies issue securities denominated in foreign currency in Eurocurrency (offshore) markets. Branches of French banks in London issue bonds for U.S. dollars, for example, and the currency board can buy such bonds if the dollar is the reserve currency. To prevent the currency board from becoming entangled in the politics of domestic government finance, though, the currency board should be forbidden to hold domestic government securities or securities issued by domestic state enterprises, no matter in what currency they are payable.

Maturity of reserves: It may be desirable for the constitution or bylaws of the currency board to limit the maturity of the assets it holds to, say, ten years. Long-term bonds with fixed interest rates fluctuate widely in value as interest rates change, although they may offer higher average returns than short-term

assets. Some British colonial currency boards that invested in long-term pound sterling bonds suffered large losses when sterling interest rates rose sharply in the 1950s, though their foreign reserves exceeded 100 per cent even so because they had accumulated reserve funds, typically equal to 10 per cent of notes and coins in circulation.

British colonial currency boards often divided their foreign reserves into a "liquid reserve" and an "investment reserve." The liquid reserve consisted of securities payable in less than two years, and was typically about 30 per cent of total reserves. The investment reserve consisted of securities payable in more than two years, and was the rest of total reserves. The investment reserve was equal to the public's estimated minimum, "hard-core" demand for currency board notes and coins (Clayton 1944: 8-11). The liquid reserve of the currency board may need to exceed 30 per cent initially, but later the board should be able to hold an increasing proportion of assets in the higher-yielding investment reserve as the economic situation of the currency board country improves.

Expenses: Judging from the experience of past currency boards, average expenses of the currency board should be no more than 1 per cent of total assets, and may as little as 1/2 per cent. The largest expense will be printing notes and minting coins. Salaries will probably be the next largest expense. Rent, utilities, and remaining costs will probably be small.

The notes issued by the currency board should be printed abroad. Printing the notes abroad will prevent the domestic government from seizing the printing presses and overturning the currency board system by printing notes unbacked by foreign reserves. The cost of printing notes abroad may be higher than it would be if they were printed domestically, but the extra expense is worthwhile as a type of insurance. The cost of printing notes is US\$26 to \$45 per thousand, depending on what design features the notes have (Berreby 1992; see also Shapiro 1993).

Seigniorage: Unlike securities and many bank deposits, notes and coins pay no interest. Hence, notes and coins are like an interest-free loan from people who hold them to the issuer. The currency board will earn gross seigniorage equal to interest from its holdings of reserve-currency securities. Its net seigniorage (profit) will be the gross seigniorage minus the expense of putting and maintaining notes and coins in circulation. In addition, if notes and coins are destroyed, the net worth of the currency board will increase, because its liabilities will decrease but its assets will not. Suppose the reserve currency of the currency board is the U.S. dollar. In the currency board system, the only difference between using currency board notes and coins instead of dollar notes and coins is that the currency board rather than the U.S. Federal Reserve System will capture the net seigniorage. The currency board can earn significant net seigniorage. A portfolio of long-term and short-term securities should earn an average return of at least 5 per cent a year. The expenses of the currency board should not exceed 1 per cent a year, and may be as little as 1/2 per cent a year. Net seigniorage, then, will probably be at least 4 per cent a year of the average circulation of the currency board's notes and coins in circulation.³²

³² For some mathematics of seigniorage, see Osband and Villanueva (1992: Appendix A). For an empirical study of seigniorage, see Fischer (1982).

How to protect a currency board

Despite the economic success of the currency board system earlier in this century, currency boards exist today only in a few countries. Currency boards elsewhere were converted into central banks because governments were influenced by incorrect economic criticisms of the currency board system, the desire to establish central banks as symbols of national independence, and an understanding of the political advantages of politicized central banks. As has been mentioned, many currency boards have relied on informal protection rather than formal legal protection from changes in their operating rules. The experience of most such currency boards, and of central banking, strongly suggests that new currency boards should have strong legal protection from being converted into a central bank. Anxiety that the monetary constitution embodied in the currency board might be subverted would reduce the willingness of foreigners to invest, diminishing one of the main advantages of the currency board system. Therefore, this section proposes ways of strengthening a currency board as a monetary constitution. The proposals can be summarized as *credibility*, *commitment*, and *competition*. They are complementary; any can be implemented separately or with the others.

A currency board can strengthen its credibility by protecting itself from potential pressure from the government. Previous chapters explained how the various features of a typical currency board make credible its commitment to a fixed exchange rate. Since any human institution, no matter how rule-bound, is administered by people and can be changed by people, the model currency board constitution of the Appendix includes a provision that a majority of the board of directors be foreigners. That will help prevent the government from bending the rules of the currency board. The foreign directors should be appointed by Western commercial banks, or perhaps by the International Monetary Fund if the IMF lends some of the initial foreign reserves of the currency board. The directors appointed by the IMF should not be IMF officials or officials of IMF member governments, because their decisions may too easily be influenced by political considerations. Precedents exist for such an arrangement. For example, only three of the eight directors of the Libyan Currency Board of the 1950s were Libyans; the rest were Britons, Frenchmen, Italians, and Egyptians chosen by their respective governments (Blowers and McLeod 1952: 453). To reduce the political influence of the domestic government on the domestic directors of the currency board, the domestic directors could be required not to be government officials and could be appointed by a trade association of privately owned banks rather than by the government.

Another way to strengthen the credibility of a currency board is for it to hold its assets in a safe-haven country such as Switzerland. The currency board can be incorporated in the safe-haven country. The currency board will then be a nonprofit, nongovernmental institution independent of the government, although government permission will of course be necessary for the currency board to operate in the currency board country. The Burmese and Jordanian currency boards, among others, approached but did not quite achieve the degree of protection from political pressure by their governments that we suggest here; they kept their headquarters in London even after Burma and Jordan became independent.

Yet another way to strengthen the credibility of a currency board is for its notes to contain a statement that they are convertible into the reserve currency at a fixed rate at the board's offices domestically and abroad. Whether or not notes and coins issued by the currency board contain an explicit statement of convertibility, they should be considered a type of contract promising a fixed exchange rate, unlike

notes and coins issued by a typical central bank. Holders of notes and coins should have the right to sue the currency board for breach of contract in the very unlikely event that it fails to redeem its notes and coins at the fixed exchange rate on demand.

A currency board can commit itself to buy and sell forward exchange at the fixed rate with the reserve currency. Some currency boards, such as that of Hong Kong, have offered three- and six-month forward exchange contracts as a way of increasing the liquidity of their foreign-exchange markets. When the forward market becomes well established, the currency board can leave it to commercial banks and cease dealing in foreign exchange. A currency board should cease dealing in forward exchange if the reserve currency approaches the inflation limits discussed in the next section.

A currency board can be subjected to competition to induce it to maintain high-quality service. People should be allowed to make contracts, payments, and deposits in any currency they wish. In particular, reserve-currency notes should be allowed to circulate alongside the notes of the currency board, as has been the case in many currency board systems based on the pound sterling. However, use of reserve-currency notes in the currency board country will probably be small, for reasons explained in the next section. (Notice that as a party to contracts and payments, the government need not accept the reserve currency for tax payments; it can insist on payment in currency board currency.)

How to change the reserve currency, if necessary

Besides lacking protection from being converted into central banks, currency boards have had one other defect: they have lacked well-defined rules for untying their currencies from an unstable reserve currency. Most currency board currencies were linked to the pound sterling, which was stable for more than a century until the Second World War. When the currency boards were established, confidence in sterling was so great that nobody considered the possibility that sterling would become unstable. After the Second World War, though, sterling did become unstable. British colonial currency boards devalued their currencies with sterling against gold and the U.S. dollar in 1949, 1967, and 1972. Devaluation hurt them by increasing the cost of many foreign goods that they needed for their economic development, such as the food that Hong Kong imported from China. Hong Kong, Singapore, Brunei, and the Eastern Caribbean Currency Authority, as well as some countries with central banks, changed from sterling to the more stable U.S. dollar as their reserve currency in the 1970s (Yeager 1976: 445, 459-68).

Changing the reserve currency is beneficial if the existing reserve currency becomes quite unstable, because otherwise the currency board system suffers the monetary problems afflicting the reserve country. (However, freedom to make contracts and payments in other currencies offers some escape from the problem.) If the currency board has the power to change the reserve currency, though, the procedure should be carefully specified in its constitution and should be enacted by the currency board itself, rather than being a somewhat arbitrary government decision as was the case with the currency boards that changed reserve currencies in the 1970s.

We suggest that the currency board not be allowed to change the reserve currency unless annualized inflation in the consumer price index of the reserve country exceeds the range -5 per cent to 20 per cent for more than two years, or -10 per cent to 40 per cent for more than six months. These are inflation

rates that historically have caused substantial economic disruption if exceeded.³³ If inflation in the reserve country exceeds the specified range, the currency board should be allowed to devalue or revalue its currency in terms of the reserve currency by no more than the amount of the inflation rate in the reserve country for the period just specified (two years or six months). Alternatively, the currency board should be allowed to choose a new, more stable reserve currency and set a new fixed exchange rate at the rate then prevailing between that currency and the original reserve currency. (If gold is the reserve currency, the currency board country itself will be considered the reserve country.) It may also be desirable for the constitution of the currency board to contain a similar provision allowing the currency board to reset the exchange rate with the reserve currency if the reserve currency appreciates or depreciates very rapidly against a basket of foreign currencies representing other countries important in foreign trade. These provisions may appear to open a loophole for destabilizing speculation, as occurs with a pegged exchange rate, but they do not. Destabilizing speculation occurs when the commitment to an exchange rate is uncertain. The commitment of the currency board to maintaining the existing exchange rate is certain, provided that the reserve currency remains within the predetermined range of inflation or appreciation. Outside the range, the commitment of the currency board to changing the exchange rate or the reserve currency is certain; hence no uncertainty exists about the behavior of the currency board, although uncertainty may exist about the behavior of the reserve currency. In any case, speculation will not reduce the foreign reserves of the currency board below 100 per cent of its notes and coins in circulation.

We offer the foregoing rules for changing the reserve currency as suggestions, which are more experimental than the other operating rules we have discussed. The general point we wish to emphasize is that it is better to respond to instability in the reserve currency by having well-defined rules, known in advance to the public, than to respond in the improvised, even capricious ways that some currency boards and governments have done.³⁴

³³ Inflation rates within the range should be tolerated because changing reserve currencies is costly for the economy. The "menu costs" are probably small, but the cost of discovering an appropriate new structure of prices to reflect the new reserve currency is probably large. Readers who think our proposed range for tolerating inflation is too large should compare it with actual inflation in many developing countries.

³⁴ Because we think that appropriate rules for changing the reserve currency can be devised, we do not share the worry of Schwartz (1992b: 20, 23) that a reserve currency, once chosen, may cause disruptions if the reserve country becomes no longer an important trading partner of the currency board country. Anyway, for most developing countries those potential disruptions are small compared to the disruptions caused by the unsound condition of their currencies at present.

6. OBJECTIONS TO CURRENCY BOARDS

A currency board system can provide a sound currency and a framework within which other problems of the monetary system of a typical developing country can be solved in a way that will be beneficial for its economy. To investigate whether establishing a currency board has disadvantages compared to allowing a typical central bank to make monetary policy, let us consider the main objections to currency boards. In the 1950s and 1960s, it was claimed that the currency board system had certain disadvantages compared to central banking. More recent economic theories and historical investigation have refuted or reduced the significance of those objections to the currency board system, but since they continue to be made, and since no widely available refutation exists, this chapter briefly considers them, as well as more recent objections.³⁵ The objections to the currency board system do not apply with full force to a parallel currency approach. For the sake of argument, though, assume that the central bank has been converted into a currency board or that the central bank has withered away because nobody uses its currency.

Most of the objections that economists have made to the currency board system, in print (for example, Roubini 1998, Williamson 1995) and in conversation with us, have been purely theoretical. They have neglected the excellent historical record of currency board systems, which has been summarized in several studies.³⁶ Many of the theoretical objections have had little practical importance for currency board systems. Many objections to the currency board system have also neglected the need to compare monetary institutions systematically. The currency board system and central banking are both integral wholes. Certain of their features imply certain other features; therefore, one should not argue as if the advantages of either system are independent of its disadvantages. For example, the flexibility possible with completely discretionary monetary policy (if flexibility is really attainable) is unavoidably connected with the risk of high inflation. It is doubtful whether that flexibility could be beneficial, even if the political pressures that tend to frustrate its exercise in practice could be surmounted.

No lender of last resort

Perhaps the most common objection to a currency board system is that it is susceptible to financial panics because it lacks a lender of last resort.³⁷

One possible reply is that the government can be a lender of last resort even if no central bank exists. The government can lend to commercial banks; for example, the Hong Kong government has several times paid depositors of insolvent banks from its accumulated budget surpluses (Freris 1991: 38-9). The absence of a central bank merely prevents the government from providing assistance by creating inflation. A more fundamental reply is that a government-sponsored lender of last resort creates more problems than it solves. Many central banks are lenders of last resort not only to commercial banks, but to state enterprises and to the government. Even if a typical central bank can be limited to acting as a

³⁵ . The best older criticisms are Analyst (1953), Basu (1971: 54-66, 240-4), Hazlewood (1954), and Nevin (1961: 1-44, 67-71). See also some of the essays in Drake (1966). The best recent criticism is Williamson (1995); see also Schwartz (1992b: 18-21). For refutations, see Greaves (1953), King (1957: 61-99), and especially Ow (1985: 54-86).

³⁶ See Ghosh and others (1998), Hanke (1999), Schuler (1992, 1996).

³⁷ A good discussion of the role of a central bank as a lender of last resort to commercial banks is Goodhart (1988: 96-102).

lender of last resort only to commercial banks, problems of moral hazard will tend to occur because commercial banks will expect that the central bank will rescue them when they become illiquid.

Lack of a central bank as a lender of last resort does not seem to have harmed currency board systems. Failures by commercial banks have been minor in orthodox currency board systems. No large commercial bank has ever failed in a currency board system, and losses to depositors from the few small commercial banks that failed have been tiny (Schuler 1992b: 191-3). Since the founding of the first currency board in 1849, there have apparently been no cases in which commercial banks in currency board systems have relied on central banks as lenders of last resort. For example, British overseas commercial banks in currency board system apparently have never relied on the Bank of England as a lender of last resort. Currency board systems have performed well without lenders of last resort. Even the currency board-like systems, which have suffered major bank failures and have used the capabilities of their monetary authorities as lenders of last resort in a limited way, bank failures have caused fewer problems than in many central banking systems. Therefore, it seems likely that after an initial restructuring, commercial banks in countries that establish currency boards can become strong, stable, and capable of preserving their liquidity without government-sponsored lenders of last resort.

Two important sources of stability for commercial banks in currency board systems have been interbank lending markets and international branch networks. As the commercial banking system develops, a large interbank lending market is likely to develop. Illiquid banks will borrow from more liquid ones, as they do in the currency board system of Hong Kong and the central banking systems of many other countries. Borrowing need not be limited to the domestic market; commercial banks can also borrow abroad and in Eurocurrency markets. By eliminating exchange risk with the reserve currency, the currency board will facilitate access of commercial banks in the currency board country to foreign financial markets. The currency board system will also encourage foreign commercial banks to establish branches, in effect importing access to foreign financial markets. Commercial banks that have international branch networks tend to be able to diversify their risks more than banks with domestic branch networks only, and hence tend to be less susceptible to fail because of localized economic shocks. In the currency board system, residents of the currency board country will be able to take advantage of the stability of commercial banks with international branch networks by depositing funds with the banks legally in the currency board country, as residents of many countries with central banks already do illegally abroad.

The risk of financial panics in a currency board system can also be reduced by private, voluntary deposit insurance. Government deposit insurance, whether explicit or implicit, is likely to be a burden to taxpayers. In developing and developed countries alike, it has cost taxpayers billions of dollars in many recent cases. Competition promotes sound banking, and is the best guarantee of safety. If compulsory deposit insurance is thought to be a political necessity, it should be operated by the banks themselves, are the private, voluntary deposit insurance systems of Switzerland, Germany, and other countries (for a list, see Talley and Mas 1990). Insurance should cover at most, say, 80 per cent of the value of large deposits, so that depositors have an incentive to avoid imprudently managed banks that pay unsustainable high interest rates.

Another way to reduce the risk of financial panics is for commercial banks to include a "notice of withdrawal clause" (option clause) in their contracts with depositors. The notice of withdrawal clause would allow a commercial bank to delay for a set period the requests of depositors to convert notes into currency board notes and coins. In return, the bank would pay a penalty rate of interest; for example, 3

per cent above the rate prevailing before it exercised the notice of withdrawal clause. Banks would be free to offer a notice of withdrawal clause or not, and depositors would be free to do business with such banks or not (see Dowd 1988, White 1984: 26, 29-30). Notice of withdrawal clauses have precedents; they were widespread among savings banks in the United States until perhaps the 1970s.

Does size matter?

Another objection to the currency board system is that it is appropriate for small economies that are open (highly dependent on foreign trade), such as Hong Kong, but not for large economies that are closed (have little foreign trade). The objection implies that a crawling peg or a floating exchange rate would encourage greater economic stability than a fixed rate.

We could reply that most countries that now have central banks are small. To repeat, Hong Kong has a larger economy than all but a handful of developing countries. A more serious reply is that terms such as "large," "closed," and even "economy" are vague. Any economic grouping can be made arbitrarily large or small, open or closed, by redrawing its boundaries. For example, a country can be considered a single, relatively large (or at least populous), somewhat open economy, or a group of much smaller, more open regional economies. The only completely, perpetually closed economy is the world. Almost every part of the world trades with the outside, therefore almost every part is to some extent open. Every large economy is composed of smaller economic units. Accordingly, economists have had difficulty devising widely accepted definitions of what constitutes a large, small, open, or closed economy.

Even accepting the terms "large," "small," "open," and "closed" as meaningful for monetary policy, experience suggests that the objection has no practical significance for the currency board system. Currency boards have been successful in small, open economies such as Hong Kong and large (populous), closed economies such as Nigeria and British East Africa, which initially had little trade with the outside world. Currency boards opened previously closed economies by providing sound currencies that encouraged trade.

Fixed versus floating exchange rates

Yet another objection to the currency board system is that a floating exchange rate is best not only for small, open economies, but for almost all countries, whether large or small. A floating exchange rate supposedly better enables an economy to adjust to changes in the terms of trade than does a fixed exchange rate.

We begin by taking the argument on its own terms. We reply that a fixed exchange rate is preferable for countries with typical central banks because a credible fixed exchange rate will enforce a durable monetary and fiscal constitution and will cease to be a subject of political contention. In particular, a fixed exchange rate will tend to end soft budget constraints. At present, expectations that a typical central bank will continue to accommodate soft budget constraints induce a vicious cycle of inflation in many developing countries. A fixed exchange rate maintained by a currency board, on the other hand, will stop inflation because the hard budget constraints that the currency board system tends to impose will induce workers and state enterprises to limit wage and price increases to competitive levels, and will prevent the government from acceding to all wage and price increases by subsidizing all unprofitable state enterprises.

Additionally, a fixed exchange rate will tend to eliminate exchange risk with the reserve currency. If a country establishes a currency board using, say, the U.S. dollar as its reserve currency, it will join a populous and wealthy common currency zone. Trade with countries in the common currency zone will be easier than it would be with a floating exchange rate because the fixed exchange rate will tend to eliminate exchange risk in the prices of goods. People in the common currency zone will be able to make more exact price calculations for internationally traded goods. That will tend to enhance economic efficiency by making the lowest-cost producers within the common currency zone those with the greatest natural advantages, not those temporarily benefiting from the extreme fluctuations in real exchange rates common with a pegged exchange rate, and to some extent with a floating exchange rate.³⁸ A fixed exchange rate will also enable entrepreneurs to apply to other problems talent that, in a monetary system with a floating exchange rate, they would apply to foreign-currency speculation and hedging. (Exchange risk with currencies outside the common currency zone will remain, so some wealth and talent will continue to be applied to foreign-exchange speculation.)

Eliminating exchange risk will encourage foreign investment in the currency board country, particularly from other countries within the common currency zone. Investors will know with certainty what exchange rate they will receive in terms of the reserve currency should they wish to repatriate profits. A fixed exchange rate will also enable the currency board country to "piggyback" on the financial markets of other countries in the common currency zone. Entrepreneurs in the currency board country will be able to use as points of reference the highly liquid, well-established markets elsewhere in the zone. Entering financial markets elsewhere in the zone will become easier. Financial markets in developed countries offer facilities for interest-rate hedging, foreign-exchange swaps, and other transactions that will not be available on a similar scale in most developing countries for years. Easy access to large foreign financial markets, with no exchange risk, will tend to increase the growth of economies that establish currency boards.

A deeper reply than the foregoing to objections to a fixed exchange rate is that debate about "fixed" versus floating exchange rates usually assumes that the monetary authority is a central bank. For that reason, advocates of floating exchange rates for the major developed countries (such as Friedman 1988 [1953]: 8-10) correctly contend that the exchange rate maintained by a central bank cannot be truly fixed, merely pegged. Unlike a typical central bank, though, a typical currency board can maintain a truly fixed exchange rate.³⁹

Debate about "fixed" (in reality, pegged) versus floating exchange rates also usually assumes that everybody in a country uses the same currency. In currency board systems, though, foreign-currency deposits, particularly reserve-currency deposits, have been common. In Hong Kong, foreign-currency deposits exceed Hong Kong dollar deposits (Jao 1992), and deposits in Japanese yen (a currency that floats against the Hong Kong dollar) are common. (Despite the existence of extensive foreign-currency

³⁸ On the performance of floating exchange rates since the end of the Bretton Woods system of pegged exchange rates in 1973, see MacDonald (1988).

³⁹ Milton Friedman (1997), the leading advocate of floating exchange rates for the major developed countries, for many years said that for developing countries fixed exchange rates, as provided by currency boards or dollarization, are more appropriate.

deposits, almost everyone in Hong Kong uses Hong Kong dollar notes and coins rather than foreign notes and coins.) Allowing people to hold foreign-currency deposits inside or outside the country in the currency board system will enable them to choose the mixture of fixed and floating currencies most suitable for them. A firm that trades with Japan may wish to hold Japanese yen. If the currency board currency floats with respect to the yen, holding yen will enable the firm to protect itself against currency risk to some degree, which will tend to improve its profitability.

Allowing people to hold deposits in foreign currency also offers a solution to economists' longstanding, inconclusive arguments about optimum currency areas, that is, the extent to which it is beneficial that a country should have one currency or multiple currencies, and fixed exchange rates or floating rates (Fenton and Murray 1992, Kawai 1992, Mundell 1961).⁴⁰ Allowing people to hold deposits in foreign currency will enable them to take advantage of any benefits of floating currencies by holding deposits in currencies that float against the currency board currency. Competition among currencies, as among other goods, is the proper way to determine optimum areas of service (see White 1989b).

Deflation

Another objection to a currency board is that it is deflationary in a growing economy. If one makes certain stringent theoretical assumptions, as the simplified examples of chapter 2 did, an increase in the demand for currency board notes and coins requires a current-account surplus to produce additional foreign reserves as backing. As an economy with a currency board grows, then, it must achieve continual current-account surpluses for the supply of currency board notes and coins to increase as quickly as the demand. Continual surpluses are unlikely, implying that in periods of balance or deficit in the current account, the supply of notes and coins will increase more slowly than the demand, resulting in deflation. Deflation would not occur if the notes and coins were liabilities of a typical central bank, which could increase the supply of notes and coins without acquiring additional foreign reserves.⁴¹

We reply that theoretical assumptions are so stringent that they rarely or never apply to actual currency board systems. A developing country experiencing healthy economic growth, such as most countries with currency boards have been, typically has a capitalaccount surplus (foreign investment) that exceeds its current-account deficit. Furthermore, the international branch networks typical of commercial banks in a currency board system reduce the demand for reserves in the currency board country compared to what it would otherwise be. Commercial banks can pool reserves between the reserve country and the currency board country. For example, ignoring the effect of differences in reserve requirements, the overall reserve position of a commercial bank with branches in Hong Kong and the United States does not change if customers of the bank in Hong Kong write Hong Kong dollar cheques to customers of the

⁴⁰ No generally agreed criteria exist for determining optimum currency areas (Kawai 1992). One criterion that has been suggested is that labor should be mobile within an optimum currency area. The experience of currency board systems has been that labor mobility with the reserve country is unimportant. For example, labor has not been mobile between Hong Kong and Britain or the United States, which have been Hong Kong's reserve countries, but Hong Kong has had rapid economic growth under the currency board system. Currency boards have encouraged trade and mobility of savings with their reserve countries, which seem to have offset lack of labor mobility with the reserve countries.

⁴¹ The converse proposition is that in a contracting economy with a currency board, the money supply operates in an inflationary manner, which some critics of the currency board system may think is a desirable countercyclical response.

bank in the United States, which the American customers then exchange for U.S. dollars. The effect is the same as if customers of the bank in San Francisco write cheques to customers of the bank in Los Angeles. Similarly, considering commercial banks as a group, if all have branches in the currency board country and the reserve country, their combined reserves do not change when people in one country make payments to people in the other country.

There has apparently been only one case of deflation in a currency board system caused by an increase in demand for notes and coins. It occurred in Hong Kong in early 1984. A few months before, Hong Kong had reintroduced the currency board system. During the Chinese New Year, the demand for notes increases because it is customary to give gifts of money. The increased demand for notes affected commercial bank reserves and interest rates in Hong Kong for about two weeks, after which they returned to their previous levels. During subsequent Chinese New Years, commercial banks in Hong Kong have held more reserves than at other times of the year, and interest rates have been affected little (Selgin 1988a: 19). Historical experience strongly suggests that the danger of deflation in a typical currency board system is small compared to the danger of inflation in a typical central banking system.

The inflation tax

A somewhat related objection to a currency board is that it deprives a country of the opportunity to impose an inflation tax of its own choosing. A currency board will supposedly deprive the domestic government of revenue precisely when the government most needs revenue. As a corollary, one may argue that at any time, a country has the sovereign right to change the rules governing its currency. country has the sovereign right to change the rules governing its currency.

We reply that the restraint on inflation that a currency board tends to impose is an advantage rather than a disadvantage. Many developing countries are now suffering from the bad effects of a high inflation tax. Most of their people would prefer a monetary system that drastically reduces the inflation tax, as shown by the widespread use of foreign currency and barter in many of those countries.

We also reply that if a government establishes a currency board as the issuer of a parallel currency, the government can continue for a time to impose an inflation tax of its own choosing by means of the central bank currency. In the long term, though, the parallel central bank currency may vanish from circulation, so the objection reappears. A more fundamental reply, then, is that a currency board does not try to earn the most seigniorage possible, but to earn an amount of seigniorage consistent with maintaining a sound currency. The seigniorage produced by extreme inflation is large in the short term, then tends to decrease steeply. Abundant experience shows that seigniorage from extreme inflation is not a reliable source of tax revenue in the long term. Moreover, extreme inflation hinders economic growth and reduces the revenue that can be raised from other taxes.

The cost of reserves

Still another objection to a currency board is that requiring the currency board to hold 100 per cent foreign reserves deprives the economy of real resources that are available in a central banking system, because a typical central bank holds much less than 100 per cent foreign reserves. Economists who investigated this topic in the 1950s claimed that 30 to 50 per cent of the reserves of currency boards were surplus, since there was a hard core of notes and coins that people would never return to the

boards for conversion into the reserve currency. The hard core corresponded to the "investment reserve." Surplus reserves are costly, because they could be used to buy imports, thus increasing the real goods available in the economy.

We reply that the surplus foreign reserves may not be as large as was claimed (Birnbaum 1957). But even if they are, consider their cost. Once spent, they are gone, and earn no interest. Foreign reserves held by a currency board, in contrast, earn interest because the currency board invests them. The stream of future interest payments has a capitalized (present-value) equivalent. The cost of surplus reserves is the difference between the value of the goods they could buy now and the capitalized equivalent of the interest that they will earn if invested. Alternatively, it is possible to calculate the risk-adjusted interest that the surplus foreign reserves would earn if lent domestically, and to compare it with the risk-adjusted interest from foreign assets. Only if domestic interest rates are significantly higher than foreign interest rates for similarly risky investments is a currency board more costly than central banking in the narrow sense of the cost of holding reserves.

Critics of the currency board system have often failed to consider that in many currency board systems, the reason that real domestic interest rates have been higher than real rates in their reserve countries is that higher rates have reflected higher political risk, higher risk of default by borrowers because of different property rights, and higher operating costs for commercial banks. After adjusting for those factors, the rates of return from domestic investments and foreign investments have been much closer to equality (Schuler 1992b: 193-5).

Some currency boards have held domestic securities as part of their assets, partly because they sought a higher return on assets, unadjusted for risk. New currency boards should not hold domestic assets, such as domestic government bonds. Holding domestic assets would risk involving the currency board in domestic politics, for example by purchasing or not purchasing certain types of domestic securities for political reasons. The more domestic assets the currency board held, the more it would be subject to political risk and political pressure from the domestic government. Another reason that the currency board should not hold domestic assets is that 100 per cent foreign reserves is a "natural" ratio that is easy to agree about. If the ratio is 90 per cent, there will be political pressure to decrease the ratio to 80 per cent, then to 70 per cent, and so on, as with a few past currency boards. Minimum gold or foreign exchange reserve ratios imposed on central banks have tended to be reduced whenever governments deemed it advisable in the name of temporary expediency. The U.S. Federal Reserve System, for instance, was originally required to hold a gold reserve ratio of 40 per cent of its notes in circulation; today the ratio is zero. A 100 per cent ratio for foreign reserves has a psychological appeal shared by no other ratio.

Colonialism

Another objection to the currency board system is that it creates a colonial relationship between the currency board country and the reserve country.

We reply that the currency board system by itself creates no colonial relationship. Historically, most currency boards have existed in British colonies, but currency boards have also existed in independent countries, including Argentina early in the 20th century, Ireland, and Jordan. The currency board-like systems that exist today are all in independent countries, too. The effect of a currency board is not to

create a colonial relationship, but to achieve more credibility than a domestic central bank can. That is why the Hong Kong dollar is linked to the U.S. dollar, even though Hong Kong was until 1997 a British colony and since then has been a special autonomous region of China. The U.S. Federal Reserve System has more credibility than the Bank of England, the central bank of China, or a Hong Kong central bank.

More generally, a fixed exchange rate, or even a pegged exchange rate, tends to create close economic relationships between countries adhering to fixed or pegged rates, yet no colonial relationship need be implied. The gold standard did not make Britain and France colonies of South Africa and Russia, two of the leading gold-producing countries, nor do the pegged exchange rates of the European Monetary System make France a colony of Germany.

As for the possibility that the currency board itself could somehow become a tool of colonialism, chapter 5 proposed ways to protect the currency board from interference by foreigners and the domestic government alike. It proposed a role for foreigners as directors of the currency board to prevent the domestic government from appointing a majority of directors intent on converting the currency board into a central bank. The proposal that a majority of the directors of the currency board should be foreigners may seem to be an insult to national pride, because it imposes an external restraint on the domestic monetary system. But restraints are typically necessary for a monetary constitution to be successful, and external restraints are especially desirable for a country that has a history of lack of self-restraint in monetary policy.

Anyway, the current monetary systems of most developing countries are not now objects of national pride; residents shun domestic currencies in preference to foreign currency. It is difficult to imagine a more colonialist type of monetary relationship than unofficial yet pervasive use of foreign currency, which signals the inability of the domestic government to provide a currency that people wish to hold. A currency board will tend to reverse currency substitution and restore an element of national pride by providing a sound domestic currency.

The worst case

A question (not really an objection) is what could happen to a currency board in the worst case imaginable. The worst case for the currency board that we can imagine is that the public converts all currency board currency into reserve currency. We reply that even in that case, little would happen. The 100 per cent foreign reserves of the currency board would ensure that it could meet all demands to convert currency board notes and coins. Instead of having currency board notes and coins, people would have reserve currency.⁴² If the exchange rate between the currency board currency and the reserve currency were one to one, it would not even be necessary for shops to recalculate prices in reserve currency for the benefit of persons spending reserve currency. Deposits at commercial banks would also be unaffected.

⁴² The discussion assumes that the deposits of the public would remain unchanged, and that the public would not try to convert a large proportion of its deposits into currency at the same time as it was converting currency board notes and coins into reserve currency. If the government had obtained the initial foreign reserves by borrowing from the IMF, it would have to repay the IMF with funds other than the net seigniorage of the currency board, because net seigniorage would now be zero.

Even in the worst case, then, the currency board would not disturb the economy as long as the exchange rate is fully credible. (If the exchange rate is not fully credible because the currency board lacks strong institutional safeguards, interest rates would rise significantly.) But the worst case will not happen. Conversion of currency board currency into reserve currency will begin a sequence of events whose simplest version is sketched in Figure 3.6. The chain of events is self-correcting, leading to new market-clearing levels of the nominal money supply, prices, and incomes. Furthermore, the necessity that payments to the government be made in currency board currency will create a hard core of demand for currency board currency, which will limit the amount of currency board notes and coins that people convert even in the worst case. Other objections can be made and other questions can be asked about the currency board system. We think that we have answered the main objections and questions, however.

7. CONCLUSION

Central banking in its current form in developing countries has resulted in unsound currencies, high inflation, and often economic stagnation. Central banks in most of those countries, even if reformed, are unlikely to provide sound currencies soon. Therefore, we suggest consideration of the currency board system. The currency board system, as used in Hong Kong and elsewhere, is a well-proven means of providing a stable, credible, fully convertible currency, and of encouraging rapid economic growth.

The currency board system has many advantages for developing countries. A currency board can be established quickly, it is simple to operate, it can be a credible monetary authority that will issue a stable, fully convertible currency, and it tends to encourage international trade and investment.

There are two ways to establish a currency board: by converting the central bank into a currency board, or by establishing the currency board as the issuer of a parallel currency. The conversion approach tends to impose hard budget constraints immediately. The parallel currency approach allows a brief transition period during which budget constraints harden and during which the government can continue to collect some revenue from inflation in the central bank currency. At the same time, the existence of the parallel currency board currency will enable much of the economy to protect itself from high inflation.

Our proposals for monetary reform are detailed and require governments that implement them to take action on many points. The most important elements of the proposal are that the currency board be established, and that the currency board be protected from political pressure to convert it into a central bank. Appropriate safeguards to protect the currency board can be devised.

The hard budget constraints that a currency board will tend to impose will create momentum for further reforms of government finance and state enterprises. A currency board best promotes economic growth if it is part of a package of wider reforms; however, a correctly established currency board is robust enough to survive and help an economy even if political pressure temporarily delays wider elements of reform. A currency board forces other monetary and economic reforms to occur because it tends to eliminate the soft budget constraints that perpetuate the current monetary system. Monetary reform is a most important step for generating growth and progress, and a currency board is the most promising means of achieving durable, beneficial monetary reform in developing countries today.

Figure 7.1. Summary of proposals

Converting the central bank into a currency board (chapter 4)

1. Delegate to other bodies all functions of the central bank other than supplying the monetary base.
2. Allow a brief period of clean, unrestricted floating exchange rates for the domestic currency.
3. Make the actions of the central bank transparent and predictable.
4. Convert some reserves of commercial banks (deposits at the central bank) into currency board notes and coins or into foreign securities, whichever the commercial banks prefer. Dispose of remaining reserves.
5. Establish a fixed exchange rate with the reserve currency.
6. Ensure that foreign reserves equal 100 per cent of domestic-currency notes and coins in circulation.
7. Transfer the remaining assets and liabilities of the central bank to the currency board and open the currency board for business.

Establishing the currency board as the issuer of a parallel currency (chapter 4)

1. Obtain initial foreign reserves for the currency board.
2. Make the currency board currency legal tender for payment of taxes and private debts.
3. Issue currency board currency equal to the initial foreign reserves.
4. Put the currency board currency into circulation, for example, by a distribution to every resident according to a well-defined plan.
5. Allow the currency board currency to circulate as a parallel currency to the central bank currency, at an exchange rate determined by market forces.

APPENDIX: A MODEL CURRENCY BOARD CONSTITUTION

To illustrate the legal foundation necessary for a currency board to work best, this appendix offers a model constitution for a currency board. The model constitution has many features adapted from the constitutions of currency boards in West Africa, Hong Kong, the British Caribbean, Libya, Burma, and elsewhere.

Currency board constitution

1. The Currency Board of Country X is hereby created by the government of Country X and the International Monetary Fund in joint cooperation. The purpose of the Currency Board is to issue notes, coins, and deposits in Currency Board units, and to maintain them fully convertible at a fixed exchange rate into a reserve currency as specified in paragraph 6.
2. The Currency Board shall have its legal seat in Switzerland.
3. a. The Currency Board shall be governed by a board of five directors. Three directors shall be foreign nationals appointed by the International Monetary Fund. They shall not be employees of the International Monetary Fund or its member governments. Two directors shall be appointed by the government of Country X.

b. A quorum shall consist of three members of the board of directors, including at least one of the directors chosen by the government of Country X. The board of directors may meet at the Currency Board's legal seat or in such other locations as it designates. Decisions shall be by majority vote, except as specified in paragraph 15.

c. The first two directors appointed by the government of Country X shall serve terms of one and four years. The first three directors appointed by the International Monetary Fund shall serve terms of two, three, and five years. Subsequent directors shall serve terms of five years. Directors may be reappointed once. Should a director resign or die, the appropriate organization as specified in paragraph 3(a) shall choose a successor to complete the remainder of the term.
4. The board of directors shall have the power to hire and fire the Currency Board's staff, and to determine salaries for the staff. The bylaws of the Currency Board shall determine salaries for the directors.
5. The Currency Board shall issue notes and coins denominated in currency board units. The notes and coins shall be fully convertible into the reserve currency. The notes shall be printed outside Country X. The Currency Board may accept deposits of the reserve currency.
6. a. The reserve currency is the foreign currency or the commodity to which the currency board currency has a fixed exchange rate. Initially, the reserve currency shall be Currency Z and the fixed exchange rate shall be A currency board units per unit of Currency Z.

b. Failure to maintain the fixed exchange rate with the reserve currency shall make the Currency Board subject to legal action for breach of contract according to the laws of Switzerland. This provision does not apply to embezzled, mutilated, or counterfeited notes, coins, and deposits, or to changes of the reserve currency in accord with paragraph 13.

7. The Currency Board shall charge no commission for exchanging Currency Board units for the reserve currency, or the reverse.

8. The Currency Board shall begin business with foreign reserves equal to at least 100 per cent of its monetary liabilities (notes and coins in circulation, deposits with it, and so on). It shall hold its foreign reserves in securities or other forms payable only in the reserve currency. The Currency Board shall not hold securities issued by the national or local governments of CountryX, or by enterprises owned by those governments.

9. The Currency Board shall pay all net seigniorage (profits) into a reserve fund until its net unborrowed reserves equal 110 per cent of its monetary liabilities. It shall remit to the government of Country X all net seigniorage beyond that necessary to maintain 110 per cent reserves. The distribution of net seigniorage shall occur annually.

10. The head office of the Currency Board shall be in City Y of Country X. The Currency Board may establish branches or appoint agents in such other cities of Country X as it sees fit. The Currency Board shall also maintain a branch in Switzerland or in the reserve country.

11. The Currency Board shall publish every business day a summary of its main balance sheet items from the previous business day. It shall publish a detailed financial statement, attested by the directors, quarterly or more often. The statement shall appraise the Currency Board's holdings of securities at their market value. The detailed statement shall be evaluated by an external auditor annually or more often.

12. The Currency Board may issue notes and coins in such denominations as it judges to be appropriate.

13. Should the annual change in the consumer price index in the reserve country fall outside the range - 5 per cent to 20 per cent for more than two years, or -10 per cent to 40 per cent for more than six months, within sixty days the Currency Board must either: a. Devalue (if the change in the index is negative) or revalue (if the change in the index is positive) the Currency Board currency in terms of the reserve currency by no more than the change in the index during the period just specified, or b. choose a new reserve currency and fix the exchange rate of the Currency Board currency to the new currency at the rate then prevailing between the new reserve currency and the former reserve currency.

14. If the Currency Board chooses a new reserve currency in accord with paragraph 13, within one year it must convert all its foreign reserves into assets payable in the new reserve currency.

15. The Currency Board may not be dissolved nor may its assets be transferred to a successor organization except by unanimous vote of the board of directors.

16. Beyond an initial loan of reserves from the International Monetary Fund, the Currency Board may not accept loans or grants of reserves from international agencies or foreign governments.

17. Exchanges by the Currency Board shall be exempt from taxation by the government of Country X.

18. Currency Board currency shall be legal tender for paying taxes and settling debts in Country X. However, it shall not be forced tender for contracts between private parties.

SELECTED BIBLIOGRAPHY

For a full bibliography of scholarship on currency boards, containing well over 1,000 items, see Gross, Heft, and Rodgers (2012). The Web site of the Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, <http://krieger.jhu.edu/iae/>, contains extensive reproductions of original source material on currency boards.

- Alesina, Alberto (1989) "Politics and business cycles in industrial democracies," *Economic Policy: A European Forum*, 4, 8, April: 57-98.
- "Analyst" (1953) "Currency and banking in Jamaica," *Social and Economic Studies*, 1: 41-53.
- Auerbach, Paul, Davison, Geoffrey, and Rostowski, Jacek (1992) "Secondary currencies and high inflation: implications for monetary theory and policy," Discussion Paper 58, Centre for Economic Performance, London School of Economics, February.
- Baliño, Tomás, Charles Enoch, and others (1997) "Currency Board Arrangements: Issues and Experiences," International Monetary Fund Occasional Paper 151, August.
- Barro, Robert J., and Gordon, David B. (1983) "Rules, discretion and reputation in a model of monetary policy," *Journal of Monetary Economics*, 12, 2: July, 101-21.
- Basu, S. K. (1971) *A Review of Current Banking Theory and Practice*, Calcutta: Macmillan.
- Berreby, David (1992) "The companies that make money from making money," *New York Times*, August 23: 10F.
- Birnbaum, Eugene A. (1957) "The cost of a foreign exchange standard or of the use of a foreign currency as the circulating medium," *International Monetary Fund Staff Papers*, 5, 3, February: 477-91.
- Bloomfield, Arthur I. (1939) *Monetary Policy under the International Gold Standard 1891-1914*, New York: Federal Reserve Bank of New York.
- Blowers, G. A., and McLeod, A. N. (1952) "Currency unification in Libya," *International Monetary Fund Staff Papers*, 2, 3, November: 439-67.
- Bogetic, Zeljko, and Hanke, Steve H. (1999) *Cronogorska Marka*, Podgorica, Montenegro: Antena M.
- Bordo, Michael D., and Jonung, Lars (1987) *The Long-Run Behavior of Velocity: The International Evidence*, Cambridge: Cambridge University Press.
- Boughton, James M. (1992) "The CFA franc: zone of fragile stability in Africa," *Finance and Development*, 29, 4, December: 34-6.
- Bruno, Michael (1991) *High Inflation and the Nominal Anchors of an Open Economy*, Essays in International Finance 183, June, Princeton: International Finance Section, Department of Economics, Princeton University.
- Buchanan, James M., and Wagner, Richard E. (1977) *Democracy in Deficit: The Political Legacy of Lord Keynes*, New York: Academic Press.
- [Caine, Sydney] (1950) *Monetary Systems of the Colonies*, London: The Banker.
- Camdessus, Michel (1992) "Monetary arrangements in Eastern Europe and the former Soviet Union," unpublished speech delivered at Bank of Greece colloquium on Monetary Integration in the Eastern European Economies, Athens, 9 October; excerpted in "Monetary arrangements should promote price stability, says Camdessus," *IMF Survey*, 9 November: 341-3.
- CIA (2014) U.S. Central Intelligence Agency, *CIA World Factbook*, <https://www.cia.gov/library/publications/the-world-factbook/>.
- Chalmers, Robert C. (1893) *A History of Currency in the British Colonies*, London: Eyre and Spottiswode for HMSO.

- Claasen, Emil-Maria (ed.) (1991) *Exchange Rate Policies in Developing and Post- Socialist Countries*, San Francisco: International Center for Economic Growth/Institute for Contemporary Studies Press.
- Clauson, G. L. M. (1944) "The British colonial currency system," *Economic Journal*, 54, 213, April: 1-25.
- Collier, Paul, and Joshi, Vijay (1989) "Exchange-rate policy in developing countries," *Oxford Review of Economic Policy*, 5, 3, Autumn: 94-113.
- Collins, Charles (1983) *Alternatives to the Central Bank in the Developing World*, Occasional Paper 20, Washington: International Monetary Fund.
- Conant, Charles A. (1969 [1927]), *A History of Modern Banks of Issue*, 6th ed. rev., New York: Augustus M. Kelley.
- Connolly, Michael (1985) "On the optimal currency peg for developing countries," *Journal of Development Economics*, 18, 2-3, August: 555-9.
- Congdon, T. G. (1985) *Economic Liberalisation in the Cone of Latin America*, Thames Essays 40, London: Trade Policy Research Centre.
- Cooper, Richard (1991a) "Opening the Soviet economy," in Merton J. Peck and Thomas J. Richardson (eds) *What Is to Be Done? Proposals for the Soviet Transition to the Market*: 116-32, New Haven: Yale University Press.
- Cooper, Richard (1991b) "Comment," in John Williamson (ed.) *Currency Convertibility in Eastern Europe*: 310-14, Washington: Institute for International Economics.
- Corbo, Vittorio, de Melo, Jaime, and Tybout, James (1986) "What went wrong with the recent reforms in the Southern Cone," *Economic Development and Cultural Change*, 34, 3, April: 607-40.
- Crick, W. F. (ed.) (1965) *Commonwealth Banking Systems*, Oxford: Clarendon Press.
- Cukierman, Alex (1992) *Central Bank Strategy, Credibility, and Independence: Theory and Evidence*, Cambridge, Massachusetts: MIT Press.
- Cukierman, Alex, Webb, Steven B., and Neyapti, Bilin (1992) "Measuring the independence of central banks and its effect on policy outcomes," *World Bank Economic Review*, 6, 3, September: 353-98.
- Culp, Christopher, and Hanke, Steve H. (2014) "The Hong Kong linked rate mechanism: monetary lessons for economic development," Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, Studies in Applied Economics No. 6, June, <http://krieger.jhu.edu/iae/economics/The%20Hong%20Kong%20Working%20Paper%20Final.pdf>.
- Culp, Christopher L., Hanke, Steve H., and Miller, Merton (1999) "The case for an Indonesian currency board," *Journal of Applied Corporate Finance*, Winter: 57-65.
- Dodwell, David (1992) "New institutions offered to keep growth on track," *Financial Times*, 8 October: 4.
- Dornbusch, Rudiger, Sturzenegger, Frederico, and Wolf, Holger (1990) "Extreme inflation: dynamics and stabilization," *Brookings Papers on Economic Activity*, 2: 1- 64, 77-84.
- Dourado, Eli, and Jerry Brito (2014) "Cryptocurrencies," in Steven N. Durlauf and Lawrence E. Blume, (eds), *The New Palgrave Dictionary of Economics*, online edition, article available at <http://mercatus.org/sites/default/files/cryptocurrency-article.pdf>.
- Dowd, Kevin (1988) "Option clauses and the stability of a laissez faire monetary system," *Journal of Financial Services Research*, 1, 4, December: 319-33.
- Dowd, Kevin (ed.) (1992a) *The Experience of Free Banking*, London: Routledge.
- Dowd, Kevin (1992b) "Money and the market: what role for government?" unpublished paper, University of Nottingham, published in *Cato Journal*, 12, 3, Winter 1993.
- Drake, P. J. (ed.) (1966) *Money and Banking in Malaya and Singapore*, Singapore: Malayan Publications.
- Drake, P. J. (1969) *Financial Development in Malaya and Singapore*, Canberra: Australian National University Press.

- Edo, Michael E. (1975) "Currency and banking legislation in the Arabian Peninsula," *International Monetary Fund Staff Papers*, 22, 2, July: 510-38.
- Enoch, Charles, and Anne-Marie Gulde (1997) "Making a currency board operational," *International Monetary Fund Paper on Policy Analysis and Assessment* 97/10, November.
- Fenton, Paul, and Murray, John (1992) "Optimum currency areas: a cautionary tale," unpublished paper, Bank of Canada, September.
- Fischer, Stanley (1982) "Seigniorage and the case for a national money," *Journal of Political Economy*, 90, 2, April: 295-313.
- Fisher, Irving (1935) *100% Money*, New York: Adelphi Press.
- Freris, Andrew (1991) *The Financial Markets of Hong Kong*, London: Routledge.
- Friedman, Milton (1948) "A monetary and fiscal framework for economic stability," *American Economic Review*, 38, 3: September, 245-64.
- Friedman, Milton (1960) *A Program for Monetary Stability*, New York: Fordham University Press.
- Friedman, Milton (1988 [1953]) "The case for flexible exchange rates," in Leo Melamed (ed.), *The Merits of Flexible Exchange Rates: An Anthology*: 3-42, Fairfax, Virginia: George Mason University Press.
- Friedman, Milton (1997) "The fix is out," *National Review*, November 24: 42-6.
- Fry, Maxwell J. (1988) *Money, Interest, and Banking in Economic Development*, Baltimore: Johns Hopkins University Press.
- Ghose, T. K. (1987) *The Banking System of Hong Kong*, Singapore: Butterworths.
- Ghosh, Atish, Anne-Marie Gulde, and Holger Wolf (1998) "Currency boards: the ultimate fix?," *International Monetary Fund Working Paper* WP/98/8.
- Goldstein, Morris, Goldstein, Morris, Isard, Peter, Masson, Paul R., and Taylor, Mark P. (1992) "Issues in the evolving international monetary system," *Occasional Paper* 96, Washington: International Monetary Fund.
- Goodhart, Charles (1988) *The Evolution of Central Banks*, Cambridge, Massachusetts: MIT Press.
- Greaves, Ida C. (1953) *Colonial Monetary Conditions*, London: HMSO.
- Greene, Joshua E., and Isard, Peter (1991) "Currency convertibility and the transformation of centrally planned economies," *Occasional Paper* 81, Washington: International Monetary Fund.
- Greenwood, John G. (1981) "Time to blow the whistle," *Asian Monetary Monitor*, 5, 4, July-August: 15-33.
- Greenwood, John G. (1983a) "How to rescue the HK\$: three practical proposals," *Asian Monetary Monitor*, 7, 5, September-October: 11-39.
- Greenwood, John G. (1983b) "The stabilisation of the Hong Kong dollar," *Asian Monetary Monitor*, 7, 6, November-December: 9-37.
- Greenwood, John G. (1984) "Why the HK\$/US\$ linked rate system should not be changed," *Asian Monetary Monitor*, 8, 6, November-December.
- Greenwood, John G., and Gressel, Daniel L. (1988) "How to tighten up the linked rate mechanism," *Asian Monetary Monitor*, 12, 1, January-February: 2-13.
- Grilli, Vittorio, Masciandro, Donato, and Tabellini, Guido (1991) "Political and monetary institutions and public financial policies in the industrial countries," *Economic Policy: A European Forum*, 13, October: 341-76, 383-92.
- Gross, Thomas, Joshua Heft, and Douglas Rodgers (2012) "On currency boards—an updated bibliography of scholarly writings," *Johns Hopkins Institute for Applied Economics, Global Health, and the Study of Business Enterprise, Studies in Applied Economics* No. 1, June,

<http://krieger.jhu.edu/iae/economics/Rodgers%20et%20al%20bibliography%20June%202013%20Final.pdf>.

- Hanke, Steve H. (1991) "Argentina should abolish its central bank," *Wall Street Journal*, October 25.
- Hanke, Steve H. (1998) "How to establish monetary stability in Asia," *Cato Journal*, 17, 3, Winter.
- Hanke, Steve H. (1999a) "Some reflections on currency boards," in Mario I. Blejer and Marko Skreb (eds) *Central Banking, Monetary Policies, and the Implications for Transition Economies*: 341-66, Norwell, Massachusetts: Kluwer Academic Publishers.
- Hanke, Steve H. (1999b) "Dollarization for Argentina," *Journal of Applied Corporate Finance*, 12, 1, Spring.
- Hanke, Steve H. (1999c) "Montenegro, the next Balkan hot spot," *Forbes Global*, September 6: 25.
- Hanke, Steve H. (2000a) "Parkinson in Euroland," *Forbes Global*, April 3: 24.
- Hanke, Steve H. (2000b) "The disregard for currency board realities," *Cato Journal*, 20, 1, Spring/Summer.
- Hanke, Steve H. (2000c) "The confidence question," *Forbes Global*, September 14.
- Hanke, Steve H. (2002a) "Currency boards," *Annals of the American Academy of Political and Social Science*, 579, January-February.
- Hanke, Steve H. (2002b) "Argentina's fall from grace," *Liberty*, April.
- Hanke, Steve H. (2002c) "Argentina: caveat lector," *Cato White Paper*, October 17
- Hanke, Steve H. (2002d) "On dollarization and currency boards: error and deception," *Journal of Policy Reform*, 5, 4: 203-222.
- Hanke, Steve H. (2003a) "A dollarization/free banking blueprint for Argentina," in Dominick Salvatore, James W. Dean and Thomas D. Willett (eds), *The Dollarization Debate*, New York: Oxford University Press.
- Hanke, Steve H. (2003b) "Money and the rule of law in Ecuador," *Journal of Policy Reform*, 6, 3. Also published in Spanish as "El dinero y el imperio de la ley en Ecuador," Quito: Hacio la Seguridad-Imperio de la Ley.
- Hanke, Steve H. (2003c) "Argentine straw man: a response to currency board critics," *Cato Journal*, 23, 1, Spring/Summer.
- Hanke, Steve H. (2008) "Why Argentina did not have a currency board," *Central Banking*, 18, 3, February.
- Hanke, Steve H., Jonung, Lars, and Schuler, Kurt (1992a) *Rahareform Vabale Eestile: Valuutafondi Lahendus*, Tartu: Tartu Ulikool.
- Hanke, Steve H., Jonung, Lars, and Schuler, Kurt (1992b) *Monetary Reform for a Free Estonia: A Currency Board Solution*, Stockholm: SNS Forlag.
- Hanke, Steve H., Jonung, Lars, and Schuler, Kurt (1993) *Russian Currency and Finance: A Currency Board Approach to Reform*, London: Routledge.
- Hanke, Steve H., and Schuler, Kurt (1990) "Keynes and currency reform: some lessons for Eastern Europe," *Journal of Economic Growth*, 4, 2: 10-16.
- Hanke, Steve H., and Schuler, Kurt (1991) "Keynes's Russian currency board," in Steve H. Hanke and Alan A. Walters (eds) *Capital Markets and Development*: 43-63, San Francisco: Institute for Contemporary Studies Press.
- Hanke, Steve H., and Kurt Schuler (1994a) *Currency Boards for Developing Countries: A Handbook*. San Francisco: ICS Press (Institute for Contemporary Studies). (The original version of this study.)
- Hanke, Steve H., and Kurt Schuler (1994b) *Valiutu taryba: pasiulymai Lietuvai*. Vilnius, Lithuania: Lietuvos Laisvosios Rinkos Institutas.

- Hanke, Steve H., and Kurt Schuler (1996) *Valutniyat bord nachalo il krai*. Sofia: Ick "Bard." (Pirated translation of Hanke and Schuler 1994a.)
- Hanke, Steve H., and Kurt Schuler (1997) *Valutniyat bord i finansovata stabilizatsiya*, translated by Ina Byachvarova and Margareta Chakapska. Sofia: Klub Ekonomuka 2000 / Friedrich Ebert Stiftung. (Authorized translation of Hanke and Schuler 1994a.)
- Hanke, Steve H., and Schuler, Kurt (1999) "A monetary constitution for Argentina: rules for dollarization," *Cato Journal*, 18, 3, Winter: 405-19, <http://www.cato.org/pubs/journal/cj18n3/cj18n3-11.pdf>.
- Hanke, Steve H. and Schuler, Kurt (2002) "What Went Wrong in Argentina?", *Central Banking*, 12, 3, February.
- Hanke, Steve H., and Walters, Alan A. (eds) (1991) "Discussion," in Steve H. Hanke and Alan A. Walters (eds) *Capital Markets and Development: 187-202*, San Francisco: Institute for Contemporary Studies Press.
- Havrylyshyn, Oleh, and Williamson, John (1991) *From Soviet disUnion to Eastern Economic Community?*, Policy Analyses in International Economics 35, October, Washington: Institute for International Economics.
- Hayek, F. A. (ed.) (1975 [1935]) *Collectivist Economic Planning*, Clifton, New Jersey: Augustus M. Kelley Publishers.
- Hayek, F. A. (1937) *Monetary Nationalism and International Stability*, London: Longmans, Green and Co.
- Hayek, F. A. (1978) *Denationalisation of Money--The Argument Refined: An Analysis of the Theory and Practice of Concurrent Currencies*, 2nd ed., Hobart Paper Special 70, London: Institute of Economic Affairs.
- Hazlewood, Arthur (1954b) "The economics of colonial monetary arrangements," *Social and Economic Studies*, 3, 3-4, December: 291-315.
- Hutton, J. P. (1992) "Real exchange rates," in Peter Newman, Murray Milgate, and John Eatwell (eds) *The New Palgrave Dictionary of Money and Finance*, 3: 303-5, London: Macmillan.
- IMF (annual) International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions*, Washington: International Monetary Fund.
- IMF (monthly) International Monetary Fund, *International Financial Statistics*.
- Jao, Y. C. (1974) *Banking and Currency in Hong Kong*, London: Macmillan.
- Jao, Y. C. (1992) "Recent trends in currency substitution," *Asian Monetary Monitor*, 16, 4, July-August: 12-21.
- Jao, Y. C., and King, F. H. H. (1990) *Money in Hong Kong: Historical Perspective and Contemporary Analysis*, Hong Kong: Centre of Asian Studies, University of Hong Kong.
- Jonung, Lars (1979) "Knut Wicksell's norm of price stabilization and Swedish monetary policy in the 1930's," *Journal of Monetary Economics*, 5, 4, October: 459-96.
- Jonung, Lars (1984) "Swedish experience under the classical gold standard 1873- 1913," in Michael D. Bordo and Anna J. Schwartz (eds) *A Retrospective on the Classical Gold Standard: 361-99*, Chicago: University of Chicago Press for National Bureau of Economic Research.
- Kawai, Masahiro (1992) "Optimum currency areas," in Peter Newman, Murray Milgate, and John Eatwell (eds) *The New Palgrave Dictionary of Money and Finance*, 3: 78-81, London: Macmillan.
- Kenen, Peter (1978) "The role of monetary policy in developing countries," in Central Bank of Gambia, Research Department, *The Role of Monetary Policy in Developing Counties: Theoretical Perspective and Institutional Framework: 9-13*, Banjul, Gambia: Central Bank of Gambia.
- King, Frank H. H. (1957) *Money in British East Asia*, London: HMSO.

- Kratz, Joachim W. (1966) "The East African Currency Board," *International Monetary Fund Staff Papers*, 13, 2, July: 229-55.
- Krugman, Paul R., and Rotemberg, Julio (1992 [1991]) "Speculative attacks on target zones," in Paul R. Krugman, *Currencies and Crises*, Cambridge, Massachusetts: MIT Press.
- Kydland, Finn E., and Prescott, Edward C. (1977) "Rules rather than discretion: the inconsistency of optimal plans," *Journal of Political Economy*, 85, 3, June: 473-92.
- Laidler, David (1982) *Monetarist Perspectives*, Cambridge, Massachusetts: Harvard University Press.
- Lee, Sheng-Yi (1974, 1986) *The Monetary and Banking Development of Singapore*, 1st ed., rev. ed., Singapore: Singapore University Press.
- Lindsey, David E., and Wallich, Henry C. (1987) "Monetary policy," in John Eatwell, Murray Milgate, and Peter Newman (eds) *The New Palgrave: A Dictionary of Economics*, 3: 508-15, London: Macmillan.
- Loynes, J. B. (1962) *The West African Currency Board 1912-1962*, London: West African Currency Board.
- MacDonald, Ronald (1988) *Floating Exchange Rates: Theories and Evidence*, London: Unwin Hyman.
- Marx, Karl, and Engels, Frederick (1948 [1848]) *The Communist Manifesto*, New York: International Publishers.
- Mates, Neven (1992) "Does the government have to clean bank balance sheets in transitional economies?" *Communist Economies and Economic Transformation*, 4, 3: 395-409.
- McKinnon, Ronald (1991) *The Order of Economic Liberalization: Financial Control in the Transition to a Market Economy*, Baltimore: Johns Hopkins University Press.
- Meltzer, Allan (1992) "The Fed at seventy-five," in Michael T. Belongia (ed.) *Monetary Policy on the Fed's 75th Anniversary: Proceedings of the Fourteenth Annual Conference of the Federal Reserve Bank of St Louis*: 3-65, Boston: Kluwer.
- Mises, Ludwig von (1981 [1932]) *Socialism*, 2nd ed., trans. by J. Kahane, Indianapolis: Liberty Classics.
- Morgenstern, Oskar (1963) *On the Accuracy of Economic Observations*, 2nd ed., Princeton: Princeton University Press.
- Moore, Des (ed.) (1992) *Can Monetary Policy Be Made to Work? Papers Presented at the IPA Monetary Policy Conference*, Jolimont, Australia: Institute of Public Affairs, Economic Policy Unit.
- Mundell, Robert A. (1961) "A theory of optimum currency areas," *American Economic Review*, 51, 3, September: 657-65.
- Nelson, William Evan (1984) "The imperial administration of currency and British banking in the Straits Settlements, 1867-1908," unpublished Ph.D. dissertation, Duke University.
- Nevin, Edward (1961) *Capital Funds in Underdeveloped Countries*, New York: St. Martin's Press.
- Newlyn, W. T., and Rowan, D. C. (1954) *Money and Banking in British Colonial Africa: A Study of the Monetary and Banking Systems of Eight British African Territories*, Oxford: Clarendon Press.
- Nuti, Domenico Mario (1991) "Comment," in John Williamson (ed.) *Currency Convertibility in Eastern Europe*: 48-55, Washington: Institute for International Economics.
- Osband, Kent, and Villanueva, Delano (1992) "Independent currency authorities: an analytic primer," International Monetary Fund Working Paper 92/50, July, published in *International Monetary Fund Staff Papers*, 40, 1, March 1993: 202-16.
- Ow, Chwee Huay (1985) "The currency board monetary system—the case of Singapore and Hong Kong," unpublished Ph.D. dissertation, Johns Hopkins University, http://krieger.jhu.edu/iae/economics/The_Currency_Board_Monetary_System.pdf.
- Perry, Guillermo E. (ed.) (1997) *Currency Boards and External Shocks: How Much Pain, How Much Gain?*, Washington: World Bank.

- Persson, Torsten, and Tabellini, Guido (1990) *Macroeconomic Policy, Credibility and Politics*, Chur, Switzerland: Harwood Academic Publishers.
- Pleskovic, Boris, and Sachs, Jeffrey (1992) "Currency reform in Slovenia: the tolar standing tall," *Transition* (World Bank Transition and Macro-Adjustment Division, Country Economics Department), 3, 8, September: 6-8.
- Porter, Richard, and Ruth Judson (1996) "The Location of U.S. Currency: How Much Is Abroad?," *Federal Reserve Bulletin*, v. 82, no. 10, October, pp. 883-903.
- Rahn, Richard (1999) *The End of Money and the Struggle for Financial Privacy*, Seattle: Discovery Institute Press.
- Revista de análisis económico* (1992) special issue on convertibility and currency substitution, 7, 1, junio.
- Rostowski, Jacek (1992) "The benefits of currency substitution during high inflation and stabilization," *Revista de análisis económico*, 7, 1, junio: 91-107.
- Rostowski, Jacek, and Shapiro, Judith (1992) "Secondary currencies in the Russian hyperinflation of 1921-24," Discussion Paper 59, Centre for Economic Performance, London School of Economics, January.
- Rothbard, Murray N. (1962) "The case for a 100 percent gold dollar," in Leland B. Yeager (ed.) *In Search of a Monetary Constitution*: 94-136, Cambridge, Massachusetts: Harvard University Press.
- Roubini, Nouriel (1998) "The case against currency boards: debunking 10 myths about the benefits of currency boards." Available online at <<http://www.stern.nyu.edu/~nroubini/asia/CurrencyBoardsRoubini.html>>.
- Sayers, R. S. (ed.) (1952) *Banking in the British Commonwealth*, London: Oxford University Press.
- Schmieding, Holger (1992) "Lending stability to Europe's emerging market economies: on the potential importance of the EC and the ECU for the transformation process in Central and Eastern Europe," Ph.D. dissertation, Christian-Albrechts Universität, Kiel, Germany, published in *Kieler Studien*, Tübingen: J. C. B. Mohr (Paul Siebeck).
- Schuler, Kurt (1992a) "The World History of Free Banking," in Kevin Dowd (ed.) *The Experience of Free Banking*: 7-47, London, Routledge.
- Schuler, Kurt (1992b) "Currency boards," unpublished Ph.D. dissertation, George Mason University.
- Schuler, Kurt (1996) *Should Developing Countries Have Central Banks? Currency Quality and Monetary Systems in 155 Countries*, Research Monograph 52. London: Institute of Economic Affairs.
- Schuler, Kurt (1998) "A contingency plan for dollarizing Hong Kong," *HKCER Letters* (Hong Kong Center for Economic Research), 52, September, available at <<http://www.hku.hk/hkcer/articles/v52/kurt.htm>>.
- Schuler, Kurt (2003) "Argentina's economic crisis: causes and cures," staff study, Office of the Vice Chairman, Joint Economic Committee, U.S. Congress, available at <http://www.hacer.org/pdf/Schuler.pdf>.
- Schuler, Kurt (2005) "Ignorance and influence: U.S. economists on Argentina's depression of 1998-2002," *Econ Journal Watch*, 2, 2: 234-278, <http://econjwatch.org/articles/ignorance-and-influence-us-economists-on-argentina-s-depression-of-1998-2002>.
- Schuler, Kurt, Selgin, George, and Sinkey, Joseph, Jr. (1991) "Replacing the ruble in Lithuania: real change versus pseudoreform," *Cato Institute Policy Analysis* 163, 28 October.
- Schwartz, Anna J. (1992a) "Currency boards: their past, present, and possible future," National Bureau of Economic Research, published in *Carnegie-Rochester Conference Series on Public Policy*, December 1993.

- Schwartz, Anna J. (1992b) *Do Currency Boards Have a Future?*, Occasional Paper 88, London: Institute of Economic Affairs.
- Selgin, George A., and Lawrence H. White (1994) "How Would the Invisible Hand Handle Money?," *Journal of Economic Literature*, 32, 4, December: 1718-49.
- Shannon, H. A. (1951) "Evolution of the colonial sterling exchange standard," *International Monetary Fund Staff Papers*, 1, 3, April: 334-354.
- Shannon, H. A. (1952) "The modern colonial sterling exchange standard," *International Monetary Fund Staff Papers*, 2, 2, April: 318-362.
- Shapiro, Joshua (1993) "Australia's plastic bills: durable and hard to counterfeit," *New York Times*, 7 February: F9.
- Simons, Henry (1934) *A Positive Program for Laissez Faire: Some Proposals for a Liberal Economic Policy*, Chicago: University of Chicago Press.
- Talley, Samuel H., and Mas, Ignacio (1990) "Deposit insurance in developing countries," World Bank Working Paper 548, November.
- Tan Pin Neo, Maggie (ed.) (1997), *Currency Board System: A Stop-Gap Measure or a Necessity. Currency Board System Symposium '97*, Singapore: Board of Commissioners of Currency Singapore.
- Taylor, Dean (1982) "Official intervention in the foreign exchange market, or, bet against the central bank," *Journal of Political Economy*, 90, 2, April: 356-68.
- Vaubel, Roland (1978) *Strategies for Currency Unification: The Economics of Currency Competition and the Case for a European Parallel Currency*, Kieler Studien 156, Tübingen: J. C. B. Mohr (Paul Siebeck).
- Walters, Alan A. (1987) "Currency boards," in Peter Newman, Murray Milgate, and John Eatwell (eds) *The New Palgrave: A Dictionary of Economics*, 1: 740-2, London: Macmillan.
- Walters, Alan (1990) *Sterling in Danger: The Economic Consequences of Pegged Exchange Rates*, London: Fontana/Collins.
- Walters, Alan (1992b) "The frontiers of reform: errors and omissions," *AIG World Markets Advisory* (AIG Trading Corp.), September: 1, 3-5.
- Walters, Alan A., and Hanke, Steve H. (1992) "Currency boards," in Peter Newman, Murray Milgate, and John Eatwell (eds) *The New Palgrave Dictionary of Money and Finance*, 1: 558-61, London: Macmillan.
- White, Lawrence H. (1984) *Free Banking in Britain: Theory, Experience and Debate 1800-1845*, Cambridge: Cambridge University Press.
- White, Lawrence H. (1989a) *Competition and Currency: Essays on Free Banking and Money*, New York: New York University Press.
- White, Lawrence H. (1989b) "Fix or float? The international monetary dilemma," in Lawrence H. White, *Competition and Currency: Essays on Free Banking and Money*: 137-47, New York: New York University Press.
- White, Lawrence H. (ed.) (1993) *Free Banking*, 3 v., Aldershot, England: Edward Elgar.
- Williamson, John (ed.) (1981) *Exchange Rate Rules: The Theory, Performance and Prospects of the Crawling Peg*, New York: St. Martin's Press.
- Williamson, John (1991) "The economic opening of Eastern Europe," in John Williamson (ed.) *Currency Convertibility in Eastern Europe*: 363-431, Washington: Institute for International Economics.
- Williamson, John (1992) *Trade and Payments After Soviet Disintegration*, Policy Analyses in International Economics 37, June, Washington: Institute for International Economics.
- Williamson, John (1995) *What Role for Currency Boards?*, Washington: Institute for International Economics.

- Williamson, John (1996) *The Crawling Band as an Exchange Rate Regime: Lessons from Chile, Colombia, and Israel*. Washington: Institute for International Economics.
- World Bank (1992) *World Development Report 1992: Development and the Environment*, Oxford: Oxford University Press.
- Yeager, Leland B. (1976) *International Monetary Relations: Theory, History, and Policy*, 2nd ed., New York: Harper and Row.
- Yeager, Leland B. (ed.) (1962) *In Search of a Monetary Constitution*, Cambridge, Massachusetts: Harvard University Press.
- Yeager, Leland (1992) "Monetary constitutions," in Peter Newman, Murray Milgate, and John Eatwell (eds) *The New Palgrave Dictionary of Money and Finance*, 2: 731-4, London: Macmillan.
- Yeager, Leland, and associates (1981) *Experiences with Stopping Inflation*, Washington: American Enterprise Institute.