Encouraging Official Dollarization In Emerging Markets

April 1999

Joint Economic Committee Staff Report
Office of the Chairman, U.S. Senator Connie Mack

This staff report expresses the views of the author only. These views do not necessarily reflect those of the Joint Economic Committee, its Chairman, Vice Chairman, or any of its Members.

Encouraging Official Dollarization in Emerging Markets

SUMMARY

In many countries that have suffered high inflation and currency devaluations, the U.S. dollar is in widespread circulation as an unofficial currency. People trust the dollar because its long-term record has been among the best in the world. However, few foreign governments have been willing to *officially* dollarize, that is, replace their domestic currencies with the dollar. One reason is that under current arrangements, if they do so they lose seigniorage--the revenue gained from issuing currency.

This study explores the implications of the United States offering to share seigniorage with countries that officially dollarize and meet certain other requirements. It describes what official dollarization is, how it works, an idea for sharing the seigniorage from the dollar with officially dollarized countries, and the effects of dollarization both on the United States and on dollarized countries.

The study concludes that official dollarization has important benefits for the United States and dollarizing countries alike. Dollarization nearly eliminate the risk of devaluation, making domestic and U.S. investment more secure. In most emerging market countries, official dollarization will also reduce interest rates significantly, boosting their economic growth. Higher growth in other countries ultimately means greater demand for American goods and higher growth in the United States as well. People in many emerging market countries have already voted with their wallets for the dollar. By sharing seigniorage with governments that officially dollarize, the United States will promote growth and financial stability both at home and abroad.

In the long term, finding ways of bribing people to dollarize, or at least give back the extra currency that is earned when dollarization takes place, ought to be an international priority. For the world as a whole, the advantage of dollarization seems clear to me... Larry Summers (1992)

1. A MISSING PIECE IN INTERNATIONAL FINANCIAL REFORM

The Asian currency crisis and its repercussions in Russia and Brazil over the last two years have created fresh interest in reforming the "international financial architecture" in the hope of making it less prone to trouble. Proposals for reform range from cautious changes in bank supervision to sweeping recommendations for establishing a global central bank. A recent scorecard counts no fewer than 16 proposals (Eichengreen 1999, pp. 124-32).

The proposals have three major drawbacks. First, all require international agreement, which is worthwhile but may take a long time to achieve and implement. Improving bank supervision internationally, for example, requires regulators from various countries to resolve some knotty technical issues about national differences in accounting and legal standards. After regulators reach agreement, fully implementing new standards of supervision can take several years. Reforms that are still more controversial, such as managing the international monetary system through exchange-rate target zones or a global central bank, face political obstacles that seem insurmountable at present, quite apart from their flaws in design.

Second, few of the proposals are well specified, so it is hard to judge whether they are workable. The complex proposals need to have their complexities visible before implementation, so that weak spots can be detected and fixed. To mention one proposal, making an international bankruptcy court effective will involve developing an extensive code of law to apply to bankruptcy cases--something that has taken decades at the national level.

Third, most proposals neglect that the Asian crisis has been foremost a *currency* crisis; the banking, stock market, and budget crises that some countries have suffered have resulted from the currency crisis rather than causing it. Proposals that omit currency reform will not solve the problem. As Table 1 shows, good currencies are rare; the U.S. dollar is one of only a handful in the world.

The countries that have suffered most from the Asian crisis have been developing countries with central banks maintaining pegged exchange rates to the U.S. dollar. Under a pegged exchange rate, a country promises to maintain a determinate value for its currency in terms of a foreign currency, but retains features of monetary policy that give it the freedom to devalue at any time and make eventual devaluation likely. Pegging and target zones, a related arrangement, are one of three basic options in exchange rate policy. Another is a floating exchange rate, like the United States, under which a country does not maintain the value of its currency constant in terms of any foreign currency. But though the United States has had relatively low average inflation under a floating exchange rate, most developing countries that

have tried floating rates have not. Those that have pegged their exchange rates have done so mainly as a way of restraining the inflation they fear would happen under floating rates. Ruling out pegging and floating leaves the third and best option for developing countries: a truly fixed exchange rate, which unlike a pegged rate has features that prevent devaluation.

What is needed, then, is a policy that can be implemented without time-consuming multilateral agreement, is well specified, and can prevent future currency crises by offering developing countries a way of achieving a truly fixed exchange rate. An option that combines all of these characteristics is *official dollarization,* under which countries that wish to do so replace their domestic currencies with the U.S. dollar. Under official dollarization, the Argentine peso, for example, will cease to exist, except perhaps as coins. All peso notes (paper money) and perhaps coins will be converted into dollar notes; all peso assets, liabilities, and prices will become dollar assets, liabilities, and prices. Since the current exchange rate is 1 peso = 1 dollar, a bank deposit of 1000 pesos will become a bank deposit of 1000 dollars.

Many countries today are already unofficially dollarized. Throughout Latin America and in most of the former Soviet Union, people have significant dollar bank deposits domestically or abroad, hold dollar notes, and quote prices for high-value items in dollars. In some countries, using the dollar is perfectly legal, in others illegal, but whatever the case, the dollar is a highly prized currency. In many countries, officially dollarizing would simply complete the extensive unofficial dollarization that already exists.

A disadvantage for countries thinking about official dollarization (all of which so far are emerging market economies) is that under current arrangements, if they dollarize they lose to the United States all their seigniorage--the revenue they gain from issuing currency. Seigniorage is the difference between the cost of putting currency into circulation and the value of the goods the currency will buy. For example, a $1 bill costs about 3 cents to print, but the government can use it to buy $1 worth of goods. The seigniorage is 97 cents. For the U.S. government, seigniorage from issuing dollars is roughly $25 billion a year, which is a large amount in dollar terms, but less than 1.5 percent of total government revenue and only about 0.3 percent of gross domestic product (GDP).

This study explores the possibility that the United States offer to share seigniorage with officially dollarized countries, as a way of reducing or eliminating the loss of seigniorage that they would otherwise experience. Their participation will be voluntary: they can continue to issue their own currencies, dollarize and share in the seigniorage that the United States earns if they meet certain criteria, or even dollarize unilaterally without sharing seigniorage. Under the arrangement described here, dollarization will probably cost American taxpayers little or nothing initially, will probably generate increased seigniorage for the United States in later years, and will have benefits for trade and for financial markets.

Whether countries share seigniorage with the United States or not, dollarization is complementary to proposals that the U.S. government has made, both alone and as part of

international groups such as the Group of 22 nations (G-22 1998). It apparently is also complementary to all other proposals for reforming the international financial architecture. It does not make any other proposed reforms more technically difficult; in fact, it would make many easier. Dollarization is in that sense a key missing piece in reforming the international financial architecture.

Table 1. Performance of the Dollar Versus Other Currencies, 1971 to 1998

Countries that avoided any years of 20+ percent inflation: Australia, Austria, Bahamas, Belgium, Belize, Bhutan, Botswana, Canada, Cyprus, Denmark, some members of Eastern Caribbean dollar zone (Antigua and Barbuda, St. Kitts and Nevis, St. Vincent and Grenadines), Finland, France, **Germany,** Hong Kong, Japan, Jordan, **Kuwait,** Luxembourg, Malaysia, Malta, Mauritania, Mauritius, Morocco, Nepal, **Netherlands,** Netherlands Antilles, New Zealand, Norway, **Panama,** Solomon Islands, South Africa, Sri Lanka, Sweden, **Switzerland,** Thailand, Tunisia, United Kingdom, **United States.**

Countries whose currencies lost no more than 25 percent of their value against the dollar or did better: Austria, Bahamas, Bahrain, Barbados, Belgium, Bermuda, Bosnia, Brunei, Cayman Islands, Denmark, Estonia, France, **Germany,** Hong Kong, Japan, **Kuwait,** Latvia, Libya, Luxembourg, Macau, Malaysia, **Netherlands,** Netherlands Antilles, Norway, Oman, **Panama,** Qatar, Saudi Arabia, Singapore, Slovakia, **Switzerland,** Taiwan, United Arab Emirates, **United States.**

Countries that had no restrictions on buying foreign currency at any time during the period: Bahrain, **Germany, Kuwait, Netherlands,** Oman, **Panama,** Qatar, Saudi Arabia, **Switzerland,** United Arab Emirates, **United States.**

Sources: IMF, *Exchange Arrangements and Exchange Restrictions,* various issues (series title varies) and *International Financial Statistics,* various issues.

Notes: Bold indicates countries whose currencies satisfy all these criteria, as the U.S. dollar does.

The data start at the beginning of 1971 because that was the first year in which the current system of generalized floating among the major currencies started to emerge. For currencies that did not exist throughout the period, the comparison starts with the first year they existed. The data are for members of the International Monetary Fund, which include almost all independent countries but few dependent territories. Information for some countries is incomplete.

2. BASICS OF DOLLARIZATION

What dollarization is: Dollarization happens when the U.S. dollar to some extent displaces domestic currency as the preferred currency for holding savings, making payments, and pricing goods. Often "dollarization" is used in a generic sense to refer to any foreign currency, not just the dollar, that displaces domestic currency.

Dollarization can be official or unofficial. Under unofficial dollarization, typically the domestic currency dominates small transactions but the dollar is important in large transactions and as a vehicle for savings. Where people do not trust the domestic banking system, they may also have large bank deposits abroad in dollars and may hold dollar notes as "mattress money." These are forms of savings that do not appear in official statistics of unofficially dollarized countries because the savings are outside the domestic financial system and in some cases violate national laws against holding foreign currency.

Less widespread is official dollarization, in which a country has no domestically issued notes and perhaps coins, instead using the dollar as official domestic currency. Many countries have used foreign currencies at some point in their history: in the United States, foreign coins were legal tender until 1857. (At the time, Americans predominantly used coins rather than notes in retail trade.)

Because this study is specifically about officially replacing the domestic currency with the U.S. dollar rather than any other currency, "dollarization" will not refer to unofficial dollarization or to currencies other than the dollar unless specifically mentioned.

Where dollarization exists: Unofficial use of foreign currency is widespread. A study from the International Monetary Fund reports that in 1995, foreign-currency deposits exceeded 30 percent of "broad money" in 18 countries. (Broad money--M2, M3, M4--is currency plus bank deposits, plus certificates of deposits and other bank liabilities in some cases.) In another 34 countries, foreign-currency deposits were lower but still judged significant, averaging 16 percent of broad money (Baliño and others 1999, pp. 2-3). In most of the cases of the IMF study, the dollar is the main foreign currency that people hold. A study by the Federal Reserve System estimates that foreigners hold 55 to 70 percent of dollar notes in circulation, mainly as $100 bills (Porter and Judson 1996, p. 899), though other researchers have estimated higher and lower figures (Feige 1997; Rogoff 1996, p. 268). Since dollar notes in circulation are currently about $480 billion, if the Federal Reserve's estimate is correct, foreigners hold roughly $300 billion. The highest concentrations occur in Latin America and the former Soviet Union. In Bolivia, for instance, people are paid in bolivianos and use them for buying groceries and other small transactions, but about 80 percent of bank deposits and many bank loans are in dollars, and expensive goods such as automobiles may be priced in and paid for in dollars. Russians are

estimated to hold as much as $40 billion in dollar notes, which is more than the value of all ruble notes and deposits (Melloan 1998).

The best-known *officially* dollarized country today is Panama, which has been dollarized since 1904. Appendix A describes its experience. Panama issues its own coins and has its own unit of account, the balboa, but since one balboa equals one U.S. dollar and coins are a small, subsidiary part of the money supply, that does not interfere with dollarization. Besides Panama, 11 other economies officially use the U.S. dollar; Table 2 lists them. Five are U.S. possessions. Another 20 or so small economies officially use foreign currencies other than the U.S. dollar, such as the Australian dollar and French franc. Several others issue domestic notes and coins but also grant the U.S. dollar or another foreign currency status as a parallel legal tender. Among them is Liberia, which formerly used U.S. dollar notes exclusively, but now also uses the notes of two rival governments issued during the civil war of 1989 to 1996. Liberian dollars circulate alongside the U.S. dollar at depreciated exchange rates (Bogetić and Schuler 1999).

Official use of the dollar or other foreign currencies is rare today except in small economies mainly because of the perceived economic advantages of an independent monetary policy. An independent monetary policy implies that a country has a distinct domestic currency, typically issued by a domestic central bank. According to some economic theories, an independent monetary policy enables a country to manage the money supply, interest rates, and exchange rates so as to make economic growth higher or at least less variable than it would otherwise be. In practice, though, developing countries with central banks have had worse currencies and lower economic growth than those without central banks (Ghosh and others 1998; Hanke 1999; Hausmann and others 1999; Schuler 1996). Despite the poor record of central banking in developing countries, it persists because many people still believe that it should work well in theory and because it has the political advantage of allowing a government to print money when it cannot or does not wish to cover its budget deficits by other means (generating a type of seigniorage). Finally, many governments see a domestically issued currency as a symbol of national identity and political pride, even if their citizens would prefer to use dollars exclusively.

How dollarization works: In an officially dollarized economy the money supply works similarly to the way it works within the United States. Panama, for example, has much the same relation to the continental United States as Puerto Rico or Pennsylvania. If people want to accumulate dollars, they spend less; if they want to get rid of dollars, they spend more. Prices and the money supply are determined by a combination of local preferences and arbitrage with the rest of the world. As within the United States, interest rates and price indexes tend to move up and down in relatively small steps, not in sudden leaps. Inflation rates can differ between Panama and the United States just as they can between Philadelphia and Los Angeles, but the use of a common currency, especially if reinforced by free trade, tends to keep prices of internationally traded goods close to the levels they have in the United States, putting a ceiling on inflation. Interest rates tend to be close to U.S. levels, plus a premium for country risk (political unrest or

other factors operating at a national level that reduce the prospect a loan will be repaid). Because a dollarized system has no domestically issued currency, except perhaps coins, there is no need for exchange controls to support the currency and crises in the balance of payments do not happen (Ingram 1962).

The main difference between a dollarized country such as Panama and the United States is that Panamanian domestic banks lack access to the Federal Reserve System as a lender of last resort. The Federal Reserve acts as a lender of last resort only to U.S. banks, not to banks from other countries. However, Panamanian banks can borrow in local money markets that are closely linked to world markets through the presence of U.S. and other foreign banks. The head offices of those banks can act as sources of emergency funds for their own branches and for other banks in Panama. It is also possible for a dollarized country to establish an international line of credit, such as Argentina has established for its currency board-like system (BCRA 1998). So, a dollarized system has or can devise substitutes for a central bank as a lender of last resort.

Seigniorage: Under current arrangements, countries that dollarize lose to the United States all their seigniorage. Earlier, seigniorage was defined as the difference between the cost of putting currency into circulation and the value of the goods the currency will buy--in the case of a $1 bill, about 97 cents. (Like a $1 bill, a $100 bill costs about 3 cents to print, so the seigniorage for it is an even larger part of its total value.) More generally, the concept of seigniorage applies not just to currency, but to the entire monetary base, which comprises currency in circulation (notes and coins outside banks) plus bank reserves (note and coins held in bank vaults, and deposits of banks at the at the central bank or such other monetary authority as the country has).

An equivalent but more complicated way to think of seigniorage is to observe that currency pays no interest. Somebody who holds $100 in notes and coins could instead buy a Treasury bond and earn interest on it. By holding notes and coins rather than the Treasury bond, it is as if he is giving the U.S. government an interest-free loan. Under this way of thinking, seigniorage is the monetary base times some measure of the interest rate.

It is important to distinguish between gross and net segniorage. Gross seigniorage is the amount earned from issuing currency before taking expenses into account. Net seigniorage is what is left after paying for printing notes, minting coins, and employing the staff of the Federal Reserve System. Net seigniorage is the part of seigniorage available for the rest of the government to spend. In recent years, the cost of printing notes and minting coins has been around $400 million a year. The cost of operating the Federal Reserve System has been roughly $2 billion, of which half has been offset by fees that banks pay, such as charges for using the Federal Reserve's check clearing system.

Table 2. Officially Dollarized (US$) Economies at the Start of 1999

Economy	**Population**	**GDP ($bn)**	**Political status/ other remarks**	**Dollarized since**
Guam*	160,000	3.0	U.S. territory	1898
Marshall Islands	61,000	0.1	independent	1944
Micronesia	120,000	0.2	independent	1944
Northern Mariana Islands*	52,000	0.5	U.S. commonwealth	1944
Palau	17,000	0.2	independent	1944
Panama	2,700,000	8.7	independent issues own coins	1904
Pitcairn Island	42	0.0	British dependency also uses New Zealand dollars	1800s
Puerto Rico*	3,800,000	33.0	U.S. commonwealth	1899
Samoa, American*	60,000	0.2	U.S. territory	1899
Turks and Caicos Islands	14,000	0.1	British colony	1973
Virgin Islands, U.K.	18,000	0.1	British dependency	1973
Virgin Islands, U.S.*	97.000	1.2	U.S. territory	1934
Total	**~7,000,000**	**~47**		
United States	*268,000,000*	*8,100,000*	*independent*	*1700s*

Sources: *Statesman's Year-Book* 1998-99; CIA 1998; IMF 1998, 1999. Population and GDP (gross domestic product) are for 1997 or latest prior year available.

Notes: * As U.S. possessions, these economies already indirectly receive a share of the seigniorage from being officially dollarized.

About 20 other economies use foreign currencies other than the U.S. dollar, such as the Australian dollar and French franc, as the official currency. Several others issue domestic notes and coins but grant the U.S. dollar or another foreign currency status as a parallel legal tender.

Except for Panama, estimates of GDP are in terms of purchasing power parity, which typically gives higher figures than the alternative method of exchange rate parity.

The net earnings of the Federal Reserve include both interest on its holdings of Treasury securities, which are like seigniorage, and earnings from trading activity to support its goals in monetary policy. The Federal Reserve buys and sells Treasury securities and foreign currencies. When its trading activity generates a profit, its payments to the Treasury are higher than the earnings from seigniorage alone would be; when trading generates a loss, the payments are lower. In 1998, more than 90 percent of the money that the Federal Reserve paid to the Treasury came from interest on Federal Reserve holdings of Treasury securities. Table 3 shows payments to the Treasury and other statistics relevant to seigniorage. Recently the payments have been about $25 billion a year. The great bulk of seigniorage derives from notes; seigniorage on coins was only about $600 million in 1998 (United States 1999, p. 261).

3. SHARING SEIGNIORAGE FROM THE DOLLAR

People have occasionally suggested before that the United States share the seigniorage from dollarization, but nobody has described in detail how to do so. To show what factors need to be taken into account, this study offers quite specific ideas, though an implemented version may differ in some details.

The idea: The U.S. government will make a standing offer to all qualifying countries. There will no time limit: qualifying countries can join, or quit, at any time. A later section describes the criteria for gaining certification from the U.S. government as a qualifying country. The purpose of the criteria is to be reasonably sure that dollar notes (paper money), rather than the notes of some other currency, will predominate in countries that eliminate their domestic currencies. The United States will accept countries that wish to accept the offer and meet the criteria for certification, but it will not pressure any country to use the dollar.

To qualify for a share of the seigniorage from dollarization, then, a country will have to retire from circulation the entire domestic-currency monetary base, except for coins if it intends to continue issuing them (like Panama). In most countries the value of coins in circulation is 5 percent or less of the value of notes in circulation, so the amount of seigniorage from coins is correspondingly small.

Economies that are already dollarized but are not U.S. possessions, and therefore do not indirectly receive a share of seigniorage through Federal spending, could qualify for a share by temporarily introducing their own currencies and then re-dollarizing. To avoid such charades, it seems fair to share seigniorage with already dollarized economies along the same lines as with newly dollarizing countries. As Table 2 shows, the combined population and economic size of already dollarized economies that are not U.S. possessions is quite small, so sharing seigniorage with them will be a correspondingly small expense.

To prevent any misunderstanding, the terms of the standing offer will state that countries accepting it acknowledge that the Federal Reserve System will not act as a lender of last resort to them, nor will it be obliged to take any but purely domestic considerations into account in formulating monetary policy. That does not mean that the Federal Reserve will ignore conditions in other countries: after all, in its recent policy making it has considered the possible effect on the U.S. economy of currency crises in Asia, Russia, and Brazil--places that are not even dollarized. Furthermore, the Federal Reserve's occasional interventions in the foreign-exchange market show that it cares about the exchange rate of the dollar with other currencies, especially the euro and the yen. But countries that become dollarized need to understand from the start that the standing offer applies only to sharing seigniorage. The Federal Reserve will not be a multinational central bank like the European Central Bank.

To strengthen the Federal Reserve System from political pressure arising from more widespread official use of the dollar, Congress should revise statute law to give the Federal Reserve a clearer mandate. The Humphrey-Hawkins Act should be revised and price stability should be made the sole goal of the Federal Reserve System. A proposal to accomplish just that was Senator Connie Mack's Economic Growth and Price Stability Act of 1997 (105th Congress, Senate bill S. 611), which should be reintroduced. A similar bill in the House of Representatives was H.R. 2360 of 1997, sponsored by Representative Jim Saxton.

What should be the basis for calculating shares of seigniorage? The most logical choice as the basis for calculating shares of seigniorage seems to be the dollar value of currency in circulation. Another possibility is the monetary base, which, to repeat, is currency in circulation plus bank reserves. Many countries require banks to hold a minimum ratio of reserves to deposits; in the United States the ratio is 10 percent. The part of the monetary base composed of bank reserves is mainly required reserves, which act as a type of tax on banks because they are typically higher than banks' economic need for reserves. Currency in circulation, on the other hand, exists because the public has a genuine demand for it, not because the public is required to hold a minimum ratio of notes and coins to total income. Counting the entire monetary base for calculating shares of seigniorage would in effect reward countries, such as Chile, that tax their banks more through reserve requirements. This study assumes for simplicity that only currency in circulation will count for calculating shares of seigniorage, but the question deserves further thought.

For the purpose of calculating the amount upon which the United States pays seigniorage, dollarizing countries will be allowed to count the domestic currency in circulation that the public actually exchanges with them for dollars, up to a maximum of all domestic currency in circulation.

To become dollarized, a country need only convert domestic currency in circulation (or at most the domestic-currency monetary base, M0) into some form of the dollar monetary base; it

need not convert broader measures of the money supply that include bank deposits, such as M1, M2, and M3; domestic-currency bank deposits will become dollar bank deposits, not dollar notes.

How much seigniorage should the United States share? It is feasible to divide the seigniorage from dollarization in any proportion: 75 percent for the dollarizing country, 25 percent for the United States, 50-50, etc. Dollarization will be more attractive the more seigniorage the United States gives. This study assumes that the United States will give dollarizing countries all the net seigniorage from *increases* in the dollar monetary base attributable to their becoming dollarized. The United States will retain all the seigniorage it collects from the approximately $540 billion of the dollar monetary base *already* in circulation, except for a small amount to "grandfather" already dollarized economies.

It bears repeating that sharing the seigniorage from dollarization with newly dollarized countries--even up to 100 percent of the seigniorage from converting domestic currency in circulation into dollars--will not reduce the current level of seigniorage that the United States receives.[1] To obtain dollar notes, a country will have to give the Federal Reserve System dollar assets of equivalent value, such as U.S. Treasury securities. If the country continued to issue its own currency and held the Treasury securities as foreign reserves, the U.S. government would

---

[1]It is possible to imagine circumstances in which the demand for dollar notes falls in a dollarizing country. Suppose that Russia dollarizes. Russians hold dollar notes of as much as $40 billion because they distrust both the ruble and Russian banks. Dollarization plus allowing foreign banks to establish branches anywhere in Russia makes bank deposits much more trustworthy, and Russians may respond by depositing much of their "mattress money" into banks, reducing their holdings of dollar notes by some billions. However, the same thing can happen without dollarization, for instance if Russia replaces its central bank with a currency board. Russians are evidently the largest holders of dollar notes after Americans, yet their estimated holdings are less than 8 percent of the total dollar monetary base. Since the dollar monetary base has been growing by $25 billion or more a year in recent years, even a large fall in demand for dollar notes in Russia will appear as a temporary slowdown in the rate of growth of the dollar monetary base, not as an actual decline. Only if a similar phenomenon happens in many countries at once will there be a decline in the dollar monetary base and the seigniorage it generates. Even so, the decline will probably be brief. Holdings of dollar notes are very likely to increase as the economies of dollarized countries grow, just as holdings of notes around the world have increased as wealth has increased.

A somewhat related point is that it is possible to imagine that giving any seigniorage at all to dollarizing countries will reduce seigniorage for the United States below what it could have been. Perhaps dollarizing counties would have become officially dollarized even without receiving any seigniorage. If that is correct, though, there should be more dollarized countries already.

pay it interest on the securities. By sharing seigniorage if the country dollarizes, the U.S. government in effect pays interest on dollar notes that it otherwise would have paid on Treasury bills. This switch neither adds nor subtracts from the total interest payments that the U.S. government makes.

Besides sharing seigniorage from the initial amount of dollars, it also seems fair to share seigniorage from a general increase in the demand for dollars, according to procedures discussed later. So, if the dollar monetary base doubles and the interest rate paid remains the same, a dollarized country will receive approximately double the amount of seigniorage it received when it first qualified for the standing offer. This seems fair because presumably dollarized countries will contribute to the general increase in demand for the dollar monetary base, so they will deserve to share in the resulting increase in seigniorage. It is like them reinvesting interest on their holdings of Treasury securities to buy new Treasury securities. Sharing seigniorage from an increase in demand for dollars also seems fair because demand for dollars depends partly on inflation, which the United States controls. As long as inflation remains low, say in single digits per year, people tend to accumulate more dollar notes when the purchasing power of the dollar falls, so as to maintain a roughly constant amount of purchasing power. If the United States did not share the increase in seigniorage resulting from the reduced purchasing power of the dollar, it would in effect benefit from higher inflation at the expense of other countries, ultimately reducing towards zero the real value of the seigniorage they receive and the incentive for them to remain dollarized. Under the formula listed later, all qualifying officially dollarized countries will share proportionally with the United States when the dollar monetary base expands or shrinks.

Sharing seigniorage is important not so much in itself as for reducing an obstacle to dollarization. Dollarization has the potential to boost economic growth in many countries because it nearly eliminates the risk of devaluation and bring interest rates closer to the levels that exist in the United States. The gains that higher economic growth would generate are potentially much larger than the amounts involved in seigniorage.

Issues for a dollarizing country: A country that wants to become officially dollarized will need to consider a number of issues. Among them are:

- Whether to continue issuing coins, like Panama, or simply use U.S. coins, like Micronesia.
- Whether the existing foreign reserves of the central bank are adequate for dollarization.
- If reserves are inadequate, how to obtain additional reserves--by selling domestic assets of the central bank or government, borrowing, etc. As is discussed later, the actual foreign reserves of many countries considering dollarization exceed their official foreign reserves because people hold foreign assets not recorded in official statistics, and a credible monetary reform such as dollarization can being some of these unrecorded reserves into official coffers.

● If the United States allows the monetary base beyond currency in circulation to be used for calculating shares of seigniorage, whether the government should convert that part of the monetary base into the dollar monetary base, convert some of it into bonds, or simply write it off.

● What exchange rate to use for exchanging domestic currency into dollars. (The more units of local currency per dollar, the lower dollar reserves need to be for immediate dollarization.)

● How fast dollarization should proceed. (Immediate dollarization, while technically feasible, may not always be viewed as politically most expedient.)

● How to handle the legal aspects of changing currencies; for example, whether to revise contracts for high rates of interest, which were made under the assumption that they would be repaid in a domestically issued currency with higher inflation than the dollar.

● How to reorganize the components of the central bank, since dollarization will transfer to the Federal Reserve System the function of making monetary policy.

Such issues can be complicated, but it is not necessary to discuss them here because they do not directly concern the United States and are to some extent treated elsewhere (Schuler 1999). Under the standing offer, each country that wishes to share seigniorage from dollarization will be free to take the route to dollarization that it thinks best so long as it ends up meeting the criteria that the U.S. government has established for sharing seigniorage. The U.S. government will have no role except to assure itself that after the conversion is complete, domestic-currency notes (and coins, if the dollarizing country chooses) are no longer circulating.

How a dollarizing country will obtain dollars: To obtain dollar notes and coins from the Federal Reserve System, a dollarizing country will give to the Federal Reserve highly liquid dollar assets of equivalent value from a short list specified by the U.S. government--deposits at the Federal Reserve, U.S. Treasury securities, or funds at U.S. banks. (The gold that many countries keep on deposit at the Federal Reserve Bank of New York could also be part of the list, although this is a question that requires further thought.) The dollar assets can be given to the Federal Reserve directly or though the intermediary of a bank that specializes in handling dollar notes. The Federal Reserve will only give dollars in exchange for specified dollar assets; it will not simply give dollars away. So, dollarization according to this arrangement requires that a country have 100 percent backing in dollar assets for whatever it dollarizes. Dollarization does not require that a government already have all the necessary assets in dollars before it can even consider starting to dollarize. The government and the central bank can have assets in other currencies, provided they can readily trade them for dollar notes or for assets acceptable to the Federal Reserve. In some countries, domestic-currency assets may have a sufficiently liquid market that the central bank can obtain a substantial amount of dollars by selling them. Again, the U.S. government will have no role in deciding what route a country takes to dollarization; all it will do is certify that a country qualifies for sharing seigniorage.

The dollarizing country will agree with the United States on a date for becoming officially dollarized, which will become the date on which the United States begins crediting to that country a share of seigniorage. By that day, at least 75 percent of domestic currency in circulation must have been exchanged for dollars. From that day on, no new domestic-currency notes and (if applicable) coins will be manufactured or placed into circulation, and the plates and dies used to make them will be destroyed. A threshold of 75 percent seems advisable because it is unrealistic to expect that people will redeem 100 percent of the domestic currency in circulation for dollars. Some notes will be kept by collectors, or will have been lost or destroyed. Substantial rather than total replacement of the monetary base should be the standard for determining that a country is dollarized.

Especially in large dollarizing countries, governments will probably find it desirable to allow people to continue to exchange domestic currency in circulation for dollars for some time after the date of official dollarization. The grace period will give people who live in remote areas time to exchange their domestic currency for dollars. To reflect this, the United States could allow dollarizing countries to make a final addition to the initial dollar amounts of their shares of seigniorage one year after the date of official dollarization.

Implementing dollarization in the dollarizing country: Besides the monetary base, other assets, liabilities, and prices will also be expressed in terms of dollars. For bookkeeping purposes, assets, liabilities, and prices will be converted on the books from domestic currency into dollars at the exchange rate that the government has set. In dollar terms, they will presumably have the same value that they had before. The only difference will be that now they will be expressed in dollars, which are a more stable unit of account.

By the day a country becomes officially dollarized, laws making the domestic currency a legal tender will cease to apply, although the government of the country may continue for some time afterwards to accept domestic currency in circulation and pay out dollars in exchange. The dollar should be made a legal tender but, in keeping with the voluntary nature of the standing offer, the United States should not pressure any dollarizing country to make it a forced tender. A legal tender is a currency that may legally be used in transactions between consenting parties, whereas a forced tender is a currency that people are legally required to accept even if they do not want it. It is possible for multiple currencies to be legal tender at the same time, though the notes of one currency will tend to dominate in circulation.

The rate of return for paying seigniorage: What rate of return (interest rate) should be used to calculate seigniorage? As has been mentioned, one way to think of the dollar monetary base is as being like Treasury securities, but paying zero interest. This suggests using the interest rate on some kind of Treasury security to calculate the gross seigniorage of dollarization. The Federal Reserve System pays out seigniorage to the Treasury weekly. If many countries become dollarized, weekly payments to them could be administratively complicated. Quarterly payments

Table 3. Statistics Relevant to Seigniorage from the Dollar, 1990 to 1999

Year	Monetary base, end of year ($bn)	Average currency in circulation ($bn)	Average interest rate, 90-day Treasury bill (%)	Federal Reserve gross expenses ($bn)	Federal Reserve net expenses ($bn)	Federal Reserve payments to Treasury ($bn)	Federal budget ($bn)
1990	325.6	246.8	7.51	1.5	0.6	24.3	1253.2
1991	337.2	267.3	5.42	1.6	0.7	19.2	1324.4
1992	366.8	292.9	3.45	1.7	0.7	22.9	1381.7
1993	400.2	322.2	3.02	1.8	0.9	14.9	1409.4
1994	434.6	345.3	4.29	2.0	1.0	18.0	1461.7
1995	453.8	372.4	5.51	2.0	1.0	23.4	1515.7
1996	475.2	394.9	5.02	2.1	1.1	20.5	1560.5
1997	513.2	425.5	5.07	2.2 est.	1.1 est.	19.6	1601.2
1998	528.6	460.1	4.81	2.2 est.	1.1 est.	24.5	1652.6
1999	--	--	--	--	--	25.4 est.	1727.1 est.

Sources: IMF 1999, line 14 (monetary base--the IMF calls it "reserve money"); *Economic Report of the President* 1999, pp. 408, 412, 419 (currency in circulation, interest rate, Federal budget); Federal Reserve System, various issues (Federal Reserve gross and net expenses); *Historical Tables* 1999, pp. 40-1 (Federal Reserve payments to Treasury).

Notes: Monetary base for 1998 is November. Net expenses (column 5) are those not covered by fees collected for clearing checks and performing other services. Federal Reserve payments to the Treasury are mainly seigniorage, but also include the Federal Reserve System's gains or losses from trading Treasury securities and foreign currency.

seem reasonable. If seigniorage is paid quarterly, a logical choice is to instruct the Federal Reserve System to calculate the rate of return on the monetary base using the average rate of the 90-day Treasury bill. The Federal Reserve will pay interest on the part of currency in circulation that the dollarizing country has exchanged for dollars, sharing seigniorage according to a formula in the next section.

The economist Robert Barro (1999) has suggested an alternative way of calculating and sharing seigniorage, which does not involve using an interest rate. He uses Argentina as an example since it is now debating dollarization. Under his plan, if Argentina had peso notes equivalent to $16 billion, it would give them to the Federal Reserve System in exchange for $16 billion in dollar notes. Unlike this study, Barro would not require Argentina to give the Federal Reserve any *dollar* assets and he would make a lump-sum payment up front instead of making a series of smaller quarterly payments for as long as Argentina remains dollarized.

The problem with Barro's idea is that Argentina could take the lump-sum payment, then turn around and reintroduce its domestic currency, cheating the U.S. government out of $16 billion. The United States would have $16 billion in peso notes that it could spend, but Argentina could simply print new notes of a different design and declare the old ones invalid. Similar problems apply if instead of peso notes the Federal Reserve holds Argentine government bonds. Argentina seems trustworthy, but not all countries may be.

4. FORMULAS FOR SHARING SEIGNIORAGE

Having analyzed the principles of sharing seigniorage, let us proceed to formulas that can be used to calculate how to share seigniorage.

Net seigniorage: Recall that gross seigniorage is the revenue earned from issuing currency before taking expenses into account, while net seigniorage is what is left after paying for printing notes, minting coins, and employing the staff of the Federal Reserve System. It is the net seigniorage that can be shared with other countries. A simple and logical formula to calculate the share of net seigniorage that a dollarized country will receive from the United States is:

Dollarized country's dollar share of net seigniorage

= ([total average dollar monetary base over the period

x average interest rate on 90-day Treasury bills during the period]

- net cost of operating the Federal Reserve)

x dollarized country's share of total dollar monetary base

x proportion of seigniorage revenue that the United States pays

If the United States pays 100 percent of the net seigniorage attributed to a dollarized country's use of the dollar, the last term of the formula is 1 (the decimal equivalent of 100 percent) and the term drops out of the formula. If the United States pays 75 percent rather than 100 percent, the last term is instead 0.75.

The share of a dollarized country in the total dollar monetary base will be determined when it becomes dollarized. (If only currency in circulation counts as the basis for calculating shares in seigniorage, one could use total dollar currency in circulation instead of the total dollar monetary base. That would change the percentages for each country but not the dollar amounts of the shares of seigniorage.) Using Argentina as an example again, suppose it becomes officially dollarized on January 1, 2000, and that all the calculations are made on the basis of the calendar year. Suppose further that the dollar monetary base on December 31, 1999 is $550 billion. To dollarize, the Argentine government gives to the Federal Reserve System Treasury securities totalling $16 billion, the amount of Argentine peso currency in circulation (notes and coins outside banks) that the public has exchanged. In return, the Argentine government receives $16 billion of dollar notes. Argentina's dollarization raises the total monetary base to $566 billion, so

Argentina's share of total average dollar monetary base
= $16 billion ÷ $566 billion
= 0.028, or 2.8 percent

(These numbers, though only examples, are fairly close to the actual numbers. The numbers in the examples will sometimes be rounded off.)

For many years the dollar monetary base has grown by 5-10 percent a year, partly from higher demand for dollars in the United States and partly from higher demand abroad. Argentina will share the increased seigniorage that comes from an increased circulation of dollars. Its share will be proportional to the share of the total dollar monetary base it had when it became dollarized. So, if no new countries become dollarized in 2000, Argentina will still be credited with 2.8 percent of the total (in decimals, 0.028). Suppose that the average interest rate on 90-day Treasury bills is 5 percent a year (in decimals, 0.05), which is above the current level of about 4.25 percent a year but is in line with the average level for 1996 to 1998. Suppose further that the net cost of operating the Federal Reserve remains $1 billion, and that the average monetary base during 2000 is $580 billion. Plugging these numbers into the formula for net seigniorage yields:

Argentina's dollar share of net seigniorage
= ([$580 billion x 0.05] - $1 billion) x 0.028 x 1
= ($29 billion - $1 billion) x 0.028 x 1
= $784 million

Adding new dollarizing countries: The figure of $580 billion is assumed to be the *average* for the entire year 2000. Suppose that the amount of the dollar monetary base *on December 31, 2000* is $600 billion. Argentina will be credited with 2.8 percent ($16.8 billion). Now suppose that on January 1, 2001, Brazil dollarizes, and that its action adds $50 billion to the monetary base, raising the monetary base immediately to $650 billion. The shares of the total monetary base will be recalculated to acknowledge Brazil's presence. Instead of being assigned a share of 2.8 percent ($16.8 billion ÷ $600 billion), Argentina will now be assigned a share of about 2.58 percent ($16.8 billion ÷ $650 billion). Argentina's percentage share of the total dollar monetary base will change, but the dollar amount of its share will remain $16.8 billion. The addition of Brazil will not change the dollar amount of Argentina's share, nor will it change the amount of seigniorage that Argentina receives, if the cost per dollar of issuing dollars is constant. If, as is likely, there are some economies of scale in issuing dollars, so that the costs of issue do not rise quite as fast as the increase in the total dollar monetary base, then Brazil's decision to dollarize will generate a slight savings in costs. Argentina, Brazil, and the United States will share the savings in the form of slightly higher net seigniorage.

If Brazil reintroduces a domestic currency or otherwise becomes ineligible for seigniorage, the division of seigniorage will be recalculated to give the United States, Argentina, and other remaining dollarized countries a proportionally bigger share. So, if adding Brazil as a dollarized country caused Argentina's share of net seigniorage to fall from 2.8 percent to 2.58 percent, dropping Brazil will raise Argentina's share back to 2.8 percent, assuming that no new countries have dollarized in the meantime. Note that if a country reintroduces a domestic currency, the total dollar monetary base does not necessarily fall. The people of the country may well hold onto dollar notes as "mattress money" if they do not trust the reintroduced domestic currency. Short of searching everyone's house, the government may not be able to acquire the dollars it dispersed to the public when it dollarized.

Already dollarized economies: What about economies that are already dollarized? Seven--the Marshall Islands, Micronesia, Palau, Panama, Pitcairn Island (a negligible case), the Turks and Caicos Islands, and the British Virgin Islands--are not U.S. possessions and so receive no seigniorage directly or indirectly. Their combined population is fewer than 3 million and their combined gross domestic product in 1997 was only about $10 billion. Unlike newly dollarizing countries, they have in effect already given up dollar assets in exchange for currency in circulation. We cannot know precisely how large the circulation is, so it is necessary to estimate. Perhaps the simplest way to do so is to assume that already dollarized countries are average in terms of their ratio of currency in circulation to gross domestic product. This would put them in the range of 4 to 6 percent of GDP; let us use a figure of 5 percent (in decimals, 0.05). The formula for calculating the dollar amount of estimated currency in circulation for an already dollarized economy is then:

Estimated currency in circulation of an already dollarized economy

= GDP x world average currency in circulation as a percentage of GDP

For 1999, the total GDP of already dollarized economies that are not U.S. possessions should be roughly $11 billion. Total estimated currency in circulation for those economies is:

Estimated currency in circulation for non-U.S. already dollarized economies
= $11 billion x 0.05
= $550 million

Suppose again that the average interest rate on 90-day Treasury bills is again 5 percent a year (in decimals, 0.05), and that the United States pays 100 percent of the net seigniorage attributable to a dollarized country's use of the dollar. The seigniorage that the United States will share with the already dollarized countries that are not U.S. possessions will then be

Dollar share of seigniorage for non-U.S. already dollarized economies
= $550 million x 0.05 x 1
= $27.5 million

Panama will receive almost 90 percent of that amount because its economy is such a large proportion of the total. The whole amount, though, is minuscule compared to the roughly $25 billion of total seigniorage from dollarization, and "grandfathering" already dollarized economies into the arrangement to share seigniorage will merely reduce slightly the *increase* of $900 million in expected Federal Reserve payments to the Treasury this year.

Why these formulas? The formulas are quite simple. That is their appeal: because they involve easily verifiable numbers, countries that are considering dollarization will know what to expect if they dollarize, and there will be less scope for arguments about how to share seigniorage. To divide the seigniorage in exact proportion to each dollarized country's use of dollars, the ideal situation would be to know how many dollar notes and coins are circulating there. Without a distinct issue of dollars for each country, one that stays within national boundaries, it is impossible to know the precise amount. In some countries demand for dollar notes and coins will grow faster than average, in others slower than average. Because every country will receive an increase in seigniorage equal to the average increase (excluding the one-time effects of new countries becoming dollarized), some countries may receive somewhat more seigniorage and others less than they would if it were possible to determine with a high degree of accuracy how many dollar notes and coins are circulating in each country. However, giving every qualifying country a proportional share of the increase in seigniorage has a rough-and-ready fairness to it because a high degree of accuracy is out of reach.

Other formulas for sharing seigniorage are conceivable, but involve difficulties because they are harder to verify and contain more room for controversy. Estimates of currency usage from household surveys have been questioned in the United States, because they give much lower figures than the total of currency actually in circulation. That is the case even though in the United States the underground economy is estimated to be smaller and notes are therefore presumably less widely used for illegal payments than they are in many other countries. Formulas based on estimates of GDP are likewise problematic because calculating GDP involves many statistical assumptions. Such formulas are appropriate only for countries that have already been dollarized for many years, where one cannot use the simple method of basing calculations on the dollars exchanged for domestic currency in circulation during dollarization.

5. CRITERIA FOR QUALIFYING TO SHARE SEIGNIORAGE

Countries wishing to qualify for sharing seigniorage from dollarization will require certification by the U.S. government. The criteria for certification will be simple and uniform.

The purpose of certification will be to ensure that a country has retired its domestic currency from circulation and that dollars are sufficiently widely used that the country is contributing significantly to total seigniorage. If people in the country mainly use the notes and coins of some other currency, such as the German mark, the country would be receiving seigniorage to which it is not contributing.

To be certified, a country will need to satisfy economic, legal, and political criteria. Meeting the criteria will not give a country a right to seigniorage from dollarization: seigniorage will be a gift of the U.S. government, not an entitlement. But it will be a gift that is dispensed according to clear rules established by law, not an arbitrary amount that varies according to whims.

Economic criteria: There must be a high probability that people in a dollarizing country will use at least the amount of dollars that comprise a country's initial share of the total dollar monetary base. Later, the country must continue to belong to the dollar zone rather than to the zone of another currency.

Some indications that a country is likely to belong to the dollar zone if dollarized are that it currently considers the exchange rate with the dollar the most important exchange rate; it buys and sells mainly dollars when it intervenes officially in the foreign-exchange market; most exports are priced in dollars; if foreign-currency deposits are allowed, the dollar is the main foreign currency held; and dollar notes already circulate more widely in an unofficial or semi-official manner than the notes of any other foreign currency.

To illustrate, compare Argentina and Bulgaria. Argentina meets all the tests just mentioned. Bulgaria does not: the exchange rate of the Bulgarian lev is fixed to the German mark rather than the dollar; the Bulgarian National Bank buys and sells marks rather than dollars in the foreign-exchange market; most exports are priced in marks or in euros, the new Western European currency of which the mark is now a subdivision; and Bulgarians seem to hold more mark notes than dollar notes. Bulgaria is part of the mark/euro zone rather than the dollar zone. If Bulgaria were to dollarize, the mark would probably drive the dollar out of circulation quickly. Sharing seigniorage would give Bulgaria revenue to which it had contributed little because Bulgarians were not using the dollar.

Argentina or other qualifying countries must have retired at least 75 percent but no more than 100 percent of domestic currency in circulation and exchanged it for dollars. (In exceptional cases where there is reason to believe that much domestic currency in circulation has been destroyed, the U.S. government can reduce the lower limit below 75 percent.) In exchange for the dollars that have replaced domestic currency in circulation, the government of the dollarizing country must have given to the Federal Reserve an equal amount of specified dollar assets, such as U.S. Treasury securities. The plates used to print domestic notes and, if applicable, the dies used to make domestic coins must be destroyed, along with the notes and coins themselves.

There should be a provision to prevent dollarizing countries that have large excess foreign reserves from engineering big last-minute increases in the dollar value of domestic currency in circulation just to gain an undeservedly share of seigniorage. One way to do this is not to count for seigniorage sharing a greater dollar value of domestic currency in circulation than the average value for the previous year plus a growth factor of no more than perhaps 10 percent. At its sole discretion, the U.S. government could allow exceptions in unusual circumstances: during a currency stabilization following a high inflation, for example, the dollar value of domestic currency in circulation often increases at double digit rates as demand for it revives.

Dollarization will be most effective in making the financial system strong if it is combined with removing exchange controls (which restrict the ability to buy foreign currency) and opening the financial system so that foreign firms can compete on an equal basis with domestic firms. As desirable as a more open financial system is, though, it seems inadvisable to make it a condition for sharing seigniorage. From an economic standpoint it may be desirable to open the financial system to foreign participation before dollarizing, but for political reasons that may be impractical. Countries that have dollarization or currency boards, which in many ways work like dollarization, have found that if their financial systems were initially closed, necessity eventually forced them to allow foreign firms, so as to take full advantage of the international pool of investment funds.

Legal criteria: The domestic currency must cease to be legal tender, although the government may continue during a grace period afterwards to pay dollars for domestic currency in circulation at the exchange rate it has set. The dollar must have legal tender status, though again, the United States should not pressure any dollarizing country to make the dollar a forced tender. The euro and the yen can be legal tender along with the dollar, for instance, even though the dollar is the dominant currency in circulation.

Should a dollarized country experience a civil war or an invasion there will be rival parties claiming payment of the country's share of seigniorage. Procedures for handling such a possibility should be developed, as the U.S. government has developed them for the general question of diplomatic recognition of governments during civil war or invasion.

Political criteria: The U.S. government must be convinced that a dollarizing country is acting in good faith, and is not trying to abuse the sharing of seigniorage somehow. It seems desirable for the United States to avoid linking the sharing of seigniorage to unrelated political issues. Dollarization has benefits for the United States even if the Administration or the Congress disagree with the policies of a country that is considering dollarization. Only under carefully specified circumstances, war against the United States being the most obvious example, should a country that has been certified be decertified for failure to meet political criteria.

Maintaining certification: To continue to be certified to share seigniorage from dollarization, a country must continue to meet the criteria, as determined by a periodic review from the U.S. government. The purpose of the review is not to use recertification as a political weapon, but merely to determine whether a country continues to deserve seigniorage because dollars continue to circulate there. As a way of discouraging the Administration from using the threat of decertification as a political weapon, decertified countries can be given the option of appealing decertification to the Congress. However, some actions will be automatic grounds for immediate decertification without appeal: reintroduction of a government-issued domestic currency, discrimination against the dollar in legal tender laws, or war against the United States. A country that is automatically decertified will forfeit any seigniorage accumulated since the previous quarter but not yet paid by the United States.

A country decertified on other than automatic grounds will have the option of negotiating a special bilateral arrangement with the United States to regain some seigniorage. Take Ukraine as a hypothetical example, since the dollar is widely used unofficially but Ukraine is close to Western Europe, which uses the euro. If Ukraine were to dollarize, but simultaneously grant the euro equal status with the dollar as legal tender, over time the euro might replace the dollar as the dominant currency in circulation as Ukraine's economy became highly integrated with the economies of Western Europe. The dollar monetary base being used in Ukraine might shrink to perhaps half of the amount credited to Ukraine, so the country would not really be generating anywhere near its proportional share of dollar seigniorage. In such circumstances, as long as a

Ukraine or another dollarized country continues to use what the U.S. government estimates to be a significant amount of the dollar monetary base, the U.S. government can offer to share seigniorage based on some individually negotiated formula less generous than the standard offer. Also, to give time for bilateral negotiations to devise a different formula, seigniorage can continue to be paid according to the standard formula for one year following decertification on other than automatic grounds. Offering to continue sharing seigniorage for up to one year after decertification will be a sign that the United States will not without warning cut foreign governments off from a source of revenue that may be important to them.

If a country is recertified within three years of decertification, the U.S. government could, with Congressional approval, award some of the "back seigniorage" that the country would have earned from being certified continuously. This provision will allow the United States to reward a government that reverses course, such as a country that carries out the first stages of reintroducing a domestic currency, then reverts to official dollarization. After three years a country will lose the chance to gain back seigniorage. Back seigniorage will be purely a gift, awarded solely at the discretion of the United States.

Who would probably qualify: Under the criteria that have been described, most countries would qualify to share seigniorage if they decided to dollarize. The main exceptions are a number of countries in Europe and Africa that are part of the euro zone. Almost all European countries west of Ukraine either belong to the European Central Bank or give the euro more weight than the dollar in their exchange rate policy. Where foreign notes are heavily used, notably in the Balkans, the German mark rather than the dollar predominates. Africa's CFA franc, which more than a dozen countries use, is pegged to the French franc, and there are some other African countries such as Morocco whose circumstances make it likely that the euro rather than the dollar would predominate if there were no domestically issued currency. (The euro now exists as a financial unit, but euro notes and coins will not replace the German mark, French franc, and other currencies until 2002.) But in principle, dollarization could extend to every country in the Americas, Asia, and the Pacific, plus almost all the former Soviet Union and half or more of Africa.

How many of those countries would actually dollarize is a different question. Dollarization probably will have little appeal in countries that already have good currencies. Singapore, for example, has had low inflation and low interest rates for many years. It is unlikely to dollarize unless most of the countries around it do so. But most emerging market countries have currencies that performed much worse than the Singapore dollar, so for them dollarization is correspondingly more attractive.

Table 4 shows data on some countries where government officials or the local press have recently shown interest in dollarization.

Table 4. Data on Some Candidates for Dollarization

Country	Population (mn)	GDP ($bn)	Budget ($bn)	Monetary base ($bn)	Currency in circulation ($bn)	Net foreign reserves ($bn)	Inflation rate (%)	Interest rate (%)
Argentina	36	324	41.1	16.4	13.5	20.8	1.0	6.81
Brazil*	160	804	113	49.0	14.4	44.2	3.2	29.50
Ecuador*	12	19.8	3.38	1.23	0.51	1.62	36.1	39.3
El Salvador	5.9	11.2	1.39	1.85	0.40	1.76	2.5	9.43
Indonesia*	200	215	34.4	10.1	5.2	9.9	57.6	62.79
Mexico	96	403	69.0	19.5	11.7	22.1	15.9	26.89
Russia*	147	443	78.6	13.0	9.1	-4.5	27.8	50.6
Venezuela	23	88.4	21.0	6.70	1.94	13.7	35.8	34.84
Panama	*2.7*	*8.7*	*2.26*	*n.a.*	*n.a.*	*0.73*	*0.6*	*6.77*
United States	*268*	*8100*	*1652.6*	*528.6*	*464.0*	*77.5*	*1.5*	*5.35*

Source: IMF 1999, lines ae and rf (exchange rates), 11 and 16c (foreign assets and liabilities of monetary authority), 14 (monetary base--the IMF calls it "reserve money"), 14a (currency in circulation), 60b (interest rate for most countries) or 60l (interest rate for Ecuador, Panama, and Venezuela), 64 (inflation--consumer price index), 82 (budget of national government), 99b (GDP), and 99z (population).

Notes: *Countries that have suffered currency crises within the last year.

n.a. = not available.

Population, GDP (gross domestic product), and budget are 1997; monetary base and foreign reserves are end-1998; inflation and interest rates are the average annual rates for 1998; monetary base, currency in circulation, and net foreign reserves are for the end of 1998. Where the data specified are unavailable, the table uses the most recent prior data.

These cases are illustrative, chosen because there has already been some local discussion of the possibility of dollarizing. Panama and the United States are included for comparison.

6. OPTIONS BEYOND THE STANDING OFFER

The standing offer will be open to all qualifying countries. If it seems prudent, the U.S. government can supplement the standing offer with options available to selected countries solely at U.S. discretion. The purpose of the options would be to help countries that might otherwise have difficulty becoming and remaining dollarized.

Assisting dollarization when reserves are less than 100 percent: The foreign reserves of many countries are greater than official statistics indicate, because people already hold considerable amounts of dollar notes and offshore deposits that escape official detection. It has been the experience of a number of countries in recent years, including Argentina and Estonia, that a credible monetary reform can bring dollar notes and offshore deposits into the domestic banking system. The foreign reserves of the banking system, including the reserves of the central bank or other monetary authority, increase. Since dollarization is a highly credible reform, it may well have a similar effect in many countries.

Even so, there may be cases where a dollarizing country lacks the dollar assets to convert all domestic currency in circulation into dollars at the going exchange rate. In such cases, the United States could lend it the shortfall and keep part or all of the seigniorage in later years to repay the loan. For example, if a country has domestic currency in circulation equal to $10 billion at the going exchange rate with the dollar, but only has $5 billion of dollar assets, the United States could extend a loan for the remaining $5 billion. Then the country would be able to convert all domestic currency in circulation into dollars. Instead of paying to the country the seigniorage from the $10 billion, the Federal Reserve would keep part or all of it until the $5 billion loan had been repaid with interest.

Such loans have potential problems, which is why they need careful scrutiny and should require Congressional approval. The United States needs to be confident that a borrowing country will remain dollarized long enough that the seigniorage it shares will repay the loan. To help ensure that the loan will be repaid, the United States should lend no more than 50 percent of the dollars that a dollarizing country exchanges for its currency in circulation. To reflect that some element of risk is involved, the loan should carry an interest rate higher than the rate used to calculate the payment of seigniorage. The rate should vary according to the likely period of the loan, and should be the rate for U.S. Treasury securities of the same maturity plus a premium that may vary from country to country. Countries that default, by ending dollarization before they have repaid the loan, will be liable for the same sanctions they would face for defaulting on other U.S. government loans.

If a country reintroduces a domestic currency before its loan is repaid, its government is unlikely to receive any direct benefit from the presence of dollars in circulation within the country. In dollarizing, it will have dispersed dollar notes and coins to the public, and it will have

no easy way to retrieve them. Dollarization in effect disperses foreign reserves that under other monetary systems are centralized in a central bank or other monetary authority; recentralizing the reserves can be difficult. If people do not trust the new domestic currency, they may continue to hold dollar notes as "mattress money." If so, the United States will receive seigniorage from the dollars even though the government of the formerly dollarized country has broken its promise.

Allowing seigniorage to be pledged as collateral: Dollarizing countries whose initial dollar reserves are less than 100 percent of domestic currency in circulation will have another option for obtaining additional reserves that does not depend on the U.S. government. Because the revenue from dollarization is a fairly steady source of income, it can be pledged as collateral, such as for lines of credit with foreign banks to support domestic banks during financial distress. The terms on which collateral is pledged is a matter for dollarized countries and their lenders. The U.S. government need not be involved except to the extent that it obeys instructions from the dollarized country to deposit seigniorage with one party rather than another. Again, the Federal Reserve System should accept no obligation to be a lender of last resort to dollarized countries, though under existing procedures the Treasury could lend to a country through the Exchange Stabilization Fund and demand that the seigniorage to be pledged as collateral. Congress could even require that countries with which the United States shares seigniorage be required to pledge the seigniorage as collateral if they borrow from the Exchange Stabilization Fund.

7. LEGISLATION AND ADMINISTRATION

Legislation: To make the standing offer durable and to specify options beyond it, should any seem advisable, the arrangements described here, or something like them, should be written into law. The law should be specific, leaving certain administrative details flexible but specifying clearly the intent and main points of the arrangement. The more predictable the rules of the offer are, the more of an encouragement there will be for countries considering dollarization.

Administration: Who should administer the arrangement that this study proposes? It seems most appropriate for the Federal Reserve System to administer certification, decertification, and payment of seigniorage, though for any international negotiations, such as whether to extend to a dollarizing country any assistance beyond the standing offer, the Treasury Department and perhaps the Department of State should be involved. The precise delineation of responsibilities is a matter for further reflection. The Federal Reserve is, by design, more independent from the Administration and the Congress than the Treasury Department. Assigning the Federal Reserve the responsibility of administering the standing offer will reinforce the impartial nature of the offer.

Paying shares of seigniorage: To pay a share of seigniorage to a dollarized country, the Federal Reserve System will credit its government each quarter with the amount calculated by using the formulas listed earlier. The government can then leave the funds on deposit at the Federal Reserve, though presumably they will not earn interest; transfer them to a commercial bank; or convert them into dollar notes and coins, as it prefers.

8. COSTS AND BENEFITS FOR THE UNITED STATES

The arrangement that this study has suggested has important benefits for the United States. It is a way for the United States to help itself and other countries at the same time.

Economic costs: As has been mentioned, "grandfathering" into the arrangement for sharing seigniorage the seven already dollarized economies that are not U.S. possessions will cost less than $30 million a year under realistic assumptions about interest rates and the size of their economies. That will hardly be noticeable beside the increase of about $900 million expected this year for the Federal Reserve System's payments to the Treasury (which include seigniorage plus profits and losses from trading). Dollarization in countries that currently issue their own currencies is highly unlikely to reduce the current level of seigniorage that the United States receives, or even reduce the rate of growth of seigniorage. Recall that giving *newly* dollarized countries the share of seigniorage attributable to their using dollars does not reduce the amount of seigniorage that the United States currently earns. It is merely like switching the government liabilities that interest is paid on, from Treasury securities to the monetary base. Since there are economies of scale in issuing currency, the more countries are dollarized, the broader the base over which to spread the costs, increasing slightly the seigniorage that the United States and dollarized countries receive.

Encouraging dollarization in other countries is unlikely to be costly in the sense of making it harder for the Federal Reserve to conduct monetary policy. More than half of all dollar notes in circulation are probably held abroad already, with the greatest growth in foreign holdings apparently occurring in recent years (Judson and Porter 1996, p. 896). But it has been precisely in recent years that the Federal Reserve has successfully reduced inflation first to 3 percent and now to less than 2 percent a year.

Political risks: Does dollarization involve political risks for the United States? One such risk is the possibility that when the Federal Reserve System increases interest rates, dollarized countries will try to exert political pressure on the U.S. government, hoping that it in turn will pressure the Federal Reserve to keep interest rates inappropriately low. The pressure is likely to be especially strong if it comes from an important country such as Mexico.

The claim that this could be a serious risk ignores that the Federal Reserve already receives criticism, because its actions already affect even countries that have separate domestic currencies and floating exchange rates. Furthermore, the quarter- and half-percentage point increases in interest rates that the Federal Reserve makes are puny compared to the 10- and 20-percentage point increases that central banks have made in such countries as Brazil, Ecuador, Indonesia, and Russia in the last two years.

As has been mentioned, the most effective way of insulating the Federal Reserve from political pressure, whether foreign or domestic, is to revise statute law to give the Federal Reserve a clearer mandate, making price stability its sole goal.

Another risk is the possibility that a large dollarized country, or a group of smaller countries, will suddenly reintroduce domestic currencies and precipitate mass dumping of dollars, forcing the Federal Reserve to increase interest rates if it wants to keep inflation low. As long as the dollar continues to be trustworthy, though, people are unlikely to dump dollars all at once. The best way to prevent mass dumping of dollars is for the dollar to continue the good performance it has sustained, especially since the early 1980s.

Benefits: If even one medium-size country such as Argentina or a number of small countries such as El Salvador dollarize, the United States is likely to gain more in new seigniorage than it loses from sharing seigniorage with already dollarized economies. Holdings of the dollar monetary base seem to be growing faster abroad than in the United States, whereas the formula for sharing seigniorage assumes that holdings grow equally fast in all dollarized countries. Accordingly, the United States will gain more in seigniorage than it otherwise would if the offer to share seigniorage encourages dollarization in countries that otherwise would have continued to issue their own currencies. In the future, should electronic money in the form of credit and debit cards replace most notes and coins in circulation, in effect capturing seigniorage for issuers and users of electronic money, the United States will probably be in the forefront of the change because it is rich and technologically advanced. Again, the formula for sharing seigniorage will probably give somewhat more to the United States than its actual share of the dollar monetary base.

Dollarization will nearly eliminate currency risk and will eliminate currency conversion fees that tourists and businesses alike pay. The gains will be small in proportion to the U.S. economy, and will depend on how many countries dollarize. The larger gains will come from higher economic growth in dollarized countries, which will increase their demand for American goods. Roughly one-third of U.S. trade in goods is with Japan and Western Europe, which are unlikely ever to dollarize because they already have relatively good currencies. But Mexico, which is gaining on Japan to become the second leading trading partner of the United States, might dollarize, and even Canada, the leading trading partner, might consider it.

By increasing the number of countries that use the dollar, dollarization will help the dollar remain the premier international currency, a status that the euro is now challenging. Dollarization by one or more large Latin American countries would significantly expand the number of people officially using the dollar, moving the population of the dollar zone well ahead of the population of the euro zone.

Dollarization should reduce complaints by American producers about foreign dumping of goods by ending the possibility that dollarized countries can devalue against the dollar. Much controversy about dumping arises because large unexpected devaluations suddenly make the goods much cheaper than they were before, not because of any technological advantage, but because of capricious exchange rate policies. It is notable that recent controversy over imports of steel concerned Russia and Brazil, whose currencies have depreciated greatly.

It is difficult to measure the precise extent to which faster economic growth in dollarized countries would benefit the U.S. economy, but it is clear that there would be a benefit. The faster other economies grow, the faster their demand for U.S. products tends to grow. Since annual seigniorage from the dollar is only about 0.3 percent the size of U.S. gross domestic product, and the annual increase in seigniorage is only about 0.01 percent of GDP, the potential exists for the growth effects of sharing seigniorage to be much larger for the United States than the gains to be had from not sharing seigniorage and not encouraging countries to dollarize.

9. COSTS AND BENEFITS FOR DOLLARIZING COUNTRIES

For many countries, the benefits of dollarization appear to outweigh the costs by far. However, the purpose of examining the costs and benefits for them is not to tell any particular country it should dollarize, but to explain why some countries may wish to dollarize.

Costs: The main readily identifiable cost of dollarization for dollarizing countries is that of acquiring additional dollar assets, if existing foreign reserves are insufficient to convert all domestic currency in circulation into dollars. Note again that to become dollarized, a country only need convert currency in circulation (or at most the domestic-currency monetary base, M0) into some form of the dollar monetary base. It need not convert broader measures of the money supply that include bank deposits, such as M1, M2, and M3; domestic-currency bank deposits will become dollar bank deposits, not dollar notes. (However, just as depositors can convert domestic-currency bank deposits into domestic-currency notes if they choose, they will be able to convert dollar deposits into dollar notes if they choose.) For a number of reasons, the costs of dollarization are lower than have generally been claimed in previous writings by economists (Bogetić and Schuler 1999, Moreno 1998).

Since the standing offer will give dollarizing countries a share in seigniorage equal to the dollar value of their domestic currency in circulation plus a proportionate share in the average growth of the dollar monetary base, it will eliminate the loss of seigniorage that they would experience from dollarizing unilaterally (which they are still free to do if they wish, and which they can accomplish without permission from the United States).

The loss of flexibility for the domestic government to determine monetary policy (especially the rate of inflation) and the lack of a domestic central bank as a lender of last resort are often considered to be costs of dollarization. However, as has been mentioned, historical experience indicates that developing countries with central banks have generally had worse currencies and lower economic growth than developing countries without central banks (Ghosh and others 1998, Hanke 1999, Hausmann and others 1999, Schuler 1996). The worst banking crises and costliest bank rescues of recent years have occurred in developing countries with central banks, suggesting that in developing countries the existence of a central bank hurts more than helps financial stability (see Caprio and Klingebiel 1996; Lindgren and others 1996, pp. 21-35, 76-7).

A related cost that is similarly hypothetical is the possibility that the United States and, say, Argentina are not what economists term an optimum currency area. The problem with the standard theory of optimum currency areas is that it looks at currencies from the viewpoint of how to centrally plan currency management instead of asking what currencies consumers prefer (White 1989). In many countries consumers obviously prefer the dollar to the domestic currency, which indicates that they consider that their countries *are* in fact part of an optimum currency area with the United States. They continue to use domestic currency to some extent mainly because laws prop it up with special privileges not granted to the dollar or other foreign currencies. There is a way for governments to test whether the domestic currency is as well liked as they think: offer government workers a choice of being paid their fixed wages either in domestic currency, or in dollars at today's exchange rate. In Mexico, for example, a government worker earning a fixed wage of 950 pesos a week over the next year would have the choice of receiving 950 pesos every payday or $100, since the current exchange rate of the peso is about 9.5 pesos per dollar. If most government workers prefer to be paid in dollars it is a sign that they consider dollarization desirable.

A final possible cost is that because dollarization brings interest rates in a dollarized country into close correspondence with interest rates in the United States, it tends to synchronize business cycles more closely than might happen if a country retains a central bank. There may be times when a country can grow faster if it has its own central bank that can lower interest rates. That is true even within the United States. Oil is a major product of Texas, so high oil prices have benefited economic growth in Texas while hurting growth in most other U.S. states, while low oil prices have hurt growth in Texas while benefiting growth in most other states. Rather than having a separate currency and manipulating it in response to fluctuations in the price of oil,

though, Texans use the dollar. The Federal Reserve orients monetary policy to the needs of the United States as a whole, not to the specific needs of Texas or any other state. Over the long term, it is clear that Texans have benefited from using the dollar rather than having a separate currency like Mexico or Venezuela, two other large oil producers. Rather than looking at isolated short-term instances where a country can grow faster if it has its own central bank, one must think of the long term. The United States has had better long-term economic growth than most other countries in part because monetary policy has been better than in most other countries.

Benefits: Dollarization nearly eliminates devaluation risk with other dollarized countries and with the United States. No monetary system can completely eliminate devaluation risk, because a country can always reintroduce a domestic currency, but dollarization is harder to reverse than other monetary reforms. Dollarization eliminates a distinct domestic currency and disperses formerly centralized foreign reserves. Reintroducing a domestic currency and then devaluing it is harder than devaluing an existing domestic currency.

By nearly eliminating devaluation risk, dollarization promotes investment and reduces interest rates. In Latin American countries that allow banks to lend within the country both in dollars and in domestic currency, interest rates in dollars are lower. Interest rates contain a premium for expected inflation, and where expected inflation is high, interest rates are high, even if the inflation does not materialize. Lower interest rates benefit consumers, businesses, and the government alike by reducing their cost of borrowing. For most Latin American countries, dollarization should make interest rates fall to U.S. levels plus no more than about 4 percentage points of risk premium, as is the case in Panama (see Table 4 above and the IMF 1999).

Dollarization eliminates balance of payments crises. Under dollarization, Panama does not worry about its balance of payments any more than Puerto Rico or Pennsylvania does. Because no separate domestic currency exists, there is no need to defend it by imposing exchange controls. If, as in Panama, dollarization is combined with a banking system that is "internationalized" (highly open to foreign participation, including unrestricted branch banking), flows of capital are little more noticeable than they are within the United States. They are not confined within national boundaries, as happens when a separate domestic currency creates devaluation risk. Hence they tend not to create the type of booms and busts based on capital flows that East Asia has experienced in recent years. In an internationalized banking system, banks looks globally at opportunities for lending and borrowing dollars, smoothing flows of capital among all the countries and regions that officially use the dollar. Dollarization in fact encourages internationalization of the financial system.

Since the United States has lower inflation than most developing countries, dollarization will reduce inflation for them. In the last 30 years, more than five-sixths of developing countries with central banks have suffered at least one year of inflation exceeding 20 percent, and more

than one-third have suffered at least one year of inflation exceeding 100 percent (Schuler 1996, p. 28). Dollarization will prevent them from repeating their experience.

All these benefits of dollarization foster economic growth. The Argentine government has estimated that dollarization would increase economic growth there by 2 percentage points a year (Warn 1999). That is almost ten times the value of seigniorage that Argentina collects from having a domestic currency--$750 million a year, approximately 0.22 percent of GDP.

Dollarization does not by itself guarantee growth--other economic policies must also be favorable to it--but by eliminating bad domestic currencies, dollarization eliminates one of the biggest obstacles to growth in many countries.

10. CONCLUSION

This study has investigated a particular arrangement for sharing dollarization, an arrangement that is simple and easy to implement. An implemented version may need to differ in some details. In particular, further thought needs to be devoted to whether to use currency in circulation or the monetary base as the basis for calculating shares of seigniorage; whether the Federal Reserve System should accept gold that dollarizing countries have on deposit at the Federal Reserve Bank of New York in exchange for dollars; whether dollarizing countries should fulfill any other criteria other than those described to qualify to share seigniorage; and what should be the division of labor between the Federal Reserve and the Treasury Department to administer the sharing of seigniorage.

Few currencies have a long-term record as good as the dollar. Because the dollar has performed relatively well, people in many countries prefer dollars to domestic currency. Unofficial dollarization is already widespread, particularly in Latin America and the former Soviet Union. People in those countries have voted with their wallets for the dollar. Official dollarization would simply give people what they want. The United States should not pressure any country to become officially dollarized. However, by offering to share seigniorage, the United States can remove an important obstacle to official dollarization, and benefit both itself and other countries by doing so.

APPENDIX: PANAMA'S EXPERIENCE WITH DOLLARIZATION

Panama broke away from Colombia to become independent in 1903. Because of the Panama Canal, Panama has long had important trade and financial links with the United States. Since 1904, Panama has officially used U.S. dollar notes as domestic currency. (Before that, dollars had been circulating unofficially.) Panama has a domestic currency, the balboa (1 balboa = 1 dollar), but it circulates only as coins. The balboa is also used as the unit of account for paying wages and so forth, but that does not affect at all the amounts that are paid. Panama has no central bank and no centralized foreign reserves. The government-owned Banco Nacional de Panamá operates as a commercial bank that does all the banking business of the government and has some business with the private sector. It also acts as a clearinghouse, though banks sometimes clear payments directly between themselves. If Citibank Panama lends Chase Manhattan Bank Panama $10 million, they may make the payment through their New York head offices.

A 1970 law liberalized Panama's financial markets and allowed full entry by foreign banks. Foreign banks have the majority of assets in the banking system, though much of their assets are foreign deposits placed in Panama because of its role as an international financial center. Panama has no exchange controls. Dollarization plus an internationalized financial system mean that Panama is well integrated into world financial markets. Despite having experienced large inflows and outflows of capital, Panama has avoided the booms and busts that have resulted from such flows in other Latin American countries.

Panama's economic performance has been better than average for Latin America. Inflation averaged 3.5 percent a year from 1971 to 1997, which was lower than in any other Latin American country and the United States. Economic growth per person averaged 1.7 percent a year in the same period. The rather low rate of growth results mainly from laws that make wages unnecessarily rigid and from tariff barriers--an example of how dollarization eliminates some but not all obstacles to rapid economic growth. There have been no system-wide banking crises, and the banking system even survived intact the problems of 1989 (Moreno 1999).

Prepared by Kurt Schuler, Senior Economist to the Chairman, (202) 224-0379.

REFERENCES

Baliño, Tomás J. T., Adam Bennett, and Eduardo Borensztein. 1999. "Monetary Policy in Dollarized Economies." Occasional Paper 171. Washington: International Monetary Fund.

Barro, Robert. 1999. "Let the Dollar Reign from Seattle to Santiago." *Wall Street Journal,* March 8, p. A18.

BCRA. 1998. Banco Central de la República Argentina. *Argentina and the Contingent Repo Facility.* October.

Bogetić, Željko, and Kurt Schuler. 1999. "Official Dollarization." Mimeograph, April.

Brand, Diana. 1993. *Currency Substitution in Developing Countries: Theory and Empirical Analysis from Latin America and Eastern Europe.* Ifo-Studien zur Entwicklungsforschung No. 24. Munich: Weltforum Verlag.

Calomiris, Charles. 1998. "Blueprints for a New Global Financial Architecture." In *Compendium of Studies on International Economic Issues Submitted to the Joint Economic Committee, Congress of the United States.* 105th Congress, 2nd Session, S. Prt. 105-68. Washington: Government Printing Office.

Calvo, Guillermo A. 1999. "The Dollarization Debate." Mimeograph, University of Maryland, April 13.

Caprio, Jr., Gerald, and Daniela Klingebiel. 1996. "Bank Insolvencies: Cross-Country Experience." World Banking Policy Research Working Paper 1620, July.

CIA. 1998. United States. Central Intelligence Agency. *CIA World Factbook.* (Annual.) Available online at <http://www.odci.gov/cia/publications/factbook/concopy.html>.

De Grauwe, Paul. 1997. *The Economics of Monetary Integration,* 3rd edition. New York: Oxford University Press.

Economic Report of the President. 1999. United States. President. *Economic Report of the President Transmitted to the Congress February 1999, Together with the Annual Report of the Council of Economic Advisors.* Washington: Government Printing Office.

Eichengreen, Barry. 1999. *Toward a New Financial Architecture: A Practical Post-Asia Agenda.* Washington: Institute for International Economics.

Federal Reserve System. *Annual Report.*

Feige, Edgar L. 1997. "Revised Estimates of the Size of the U.S. Underground Economy: The Implications of U.S. Currency Held Abroad." In Owen Lippert and Michael Walker, editors, *The Underground Economy: Global Evidence of Its Size and Impact.* Vancouver: Fraser Institute.

Fischer, Stanley. 1982. "Seigniorage and the Case for a National Money." *Journal of Political Economy,* v. 90, no. 2, April, pp. 295-313.

G-22. 1998. Group of 22. *Reports on the International Financial Architecture.* Washington: Group of 22. Available online at <http://www.imf.org/external/np/g22/index.htm>.

Ghosh, Atish R., Anne-Marie Gulde, and Holger C. Wolf. 1998. "Currency Boards: The Ultimate Fix?" International Monetary Fund, Policy Development and Review Department, Working Paper 98/8. Available online at <http://www.imf.org>.

Hanke, Steve H. 1999. "Some Thoughts on Currency Boards." In Mario I. Blejer and Marko Skreb, editors, *Balance of Payments, Exchange Rates and Competitiveness in Transition Economies.* Norwell, Massachusetts: Kluwer Academic Publishers.

Hausmann, Ricardo, Michael Gavin, Carmen Pages-Serra, and Ernesto Stein. 1999. "Financial Turmoil and the Choice of Exchange Rate Regime." Working paper, Inter-American Development Bank, March 1999. Available online at <http://www.iadb.org>.

Historical Tables. 1999. United States. Office of Management and Budget. *Historical Tables: Budget of the United States Government, Fiscal Year 2000.* H. Doc. 106-003/vol. 4. Washington: Government Printing Office.

IMF. 1998. International Monetary Fund. *Exchange Arrangements and Exchange Restrictions.* Washington: International Monetary Fund. (Annual; series title varies.)

IMF. 1999. International Monetary Fund. *International Financial Statistics,* April.

Ingram, James C. 1962. *Regional Payments Mechanisms: The Case of Puerto Rico.* Chapel Hill, North Carolina: University of North Carolina Press.

Lamdany, Ruben, and Jorge Dorlhiac. 1987. "The Dollarization of a Small Economy." *Scandinavian Journal of Economics,* v. 89, no. 1, pp. 91-102.

Lindgren, Carl-Johan, Gillian Garcia, and Matthew I. Saal. 1996. *Bank Soundness and Macroeconomic Policy.* Washington: International Monetary Fund.

Makinen, Gail. 1998. "Euro Currency: How Much Could It Cost the United States?" Congressional Research Service, Library of Congress, Report 98-998E, December 21.

Makinen, Gail. 1999. "If Argentina Decides to Use the U.S. Dollar, What Does It Mean for Both Countries?" Congressional Research Service, Library of Congress, Report RS20105, March 5.

Melloan, George. 1998. "Another Russian Crisis? Define 'Crisis' Please," *Wall Street Journal,* June 2.

Mizen, Paul, and Eric J. Pentecost, editors. 1996. *The Macroeconomics of International Currencies: Theory, Policy and Evidence.* Cheltenham, England: Edward Elgar.

Moreno Villalaz, Juan Luis. 1998. "Cost of Using the Dollar as Currency." Mimeograph, Ministry of Economy and Finance, Panama.

Moreno Villalaz, Juan Luis. 1999. "Lessons from the Monetary Experience of Panama: A Dollar Economy with Financial Integration." Forthcoming in *Cato Journal,* vol. 18, no. 3, Winter. An earlier, longer version was published as *La experiencia monetaria de Panamá: lecciones de un economía dolarizada, con una banca internacional.* Panama City: Banco Nacional de Panamá, 1997.

Porter, Richard D., and Ruth A. Judson. 1996. "The Location of U.S. Currency: How Much Is Abroad?" *Federal Reserve Bulletin,* v. 82, no. 10, October, pp. 883-903. A longer version appeared in 1996 as an unpublished technical paper.

Revista de Análisis Económico. 1992. Special issue on convertibility and currency substitution, vol. 7, no. 1, June.

Rogoff, Kenneth. 1998. "Blessing or Curse? Foreign and Underground Demand for Euro Notes." *Economic Policy: A European Forum,* no. 26, April, pp. 263-303.

Schuler, Kurt. 1996. *Should Developing Countries Have Central Banks? Monetary Systems and Currency Quality in 155 Countries.* Research Monograph No. 52. London: Institute of Economic Affairs.

Schuler, Kurt. 1999. "So You Want to Dollarize." Mimeograph, forthcoming.

The Statesman's Year-Book. 1998-99. New York: St. Martin's Press, 1998.

Summers, Larry. 1992. "Rules, Real Exchange Rates, and Monetary Discipline." In Nissan Liviatan, editor, *Proceedings of a Conference on Currency Boards and Currency Substitution,* pp. 32-3. Discussion Paper 207. Washington: World Bank, 1993. (The conference itself was held in January 1992.)

United States. 1999. *Analytical Perspectives: Budget of the United States Government, Fiscal Year 2000.* H. Doc. 106-003, vol. 3. Washington: Government Printing Office.

Warn, Ken. 1999. "Menem Forces Dollar Plan to Top of Political Agenda." *Financial Times,* January 27, p. 3.

White, Lawrence H. 1989. "Fix or Float? The International Monetary Dilemma." In Lawrence H. White, *Competition and Currency: Essays on Free Banking and Money,* pp. 137-47. New York: New York University Press.