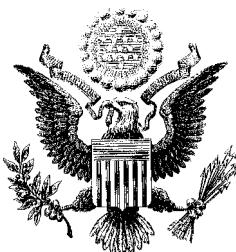


WHY CURRENCY CRISES HAPPEN



Jim Saxton (R-NJ), Chairman

**Joint Economic Committee
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Summary

Major currency crises have been frequent in the last 10 years. Currency crises are caused, or at least enabled, by inconsistent monetary policy. There is a basis in economic theory for the “bipolar view” of exchange rates, which contends that the extremes of fixed and floating exchange rates are less likely to suffer currency crises than the middle ground of pegged exchange rates. Countries can reduce their chances of suffering currency crises by avoiding pegged rates.

Joint Economic Committee
1537 Longworth House Office Building
Washington, DC 20515
Phone: 202-226-3234
Fax: 202-226-3950

Internet Address:
<http://www.house.gov/jec/>

G-01 Dirksen Senate Office Building
Washington, DC 20510
Phone: 202-224-5171
Fax: 202-224-0240

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WHY CURRENCY CRISES HAPPEN

I. SOME BASICS OF CURRENCY CRISES

The last ten years have seen eight major currency crises, most recently in Argentina, and many minor crises.¹ Understanding what causes currency crises can help countries avoid them. This report develops an explanation of currency crises in terms of the most basic concepts of economic theory, supply and demand—in this case, the supply of, and demand for, a currency. Most of the paper is devoted to laying out the theoretical framework for understanding currency crises; the implications for policy making are discussed near the end.

What a currency crisis is. A currency crisis is a situation in which a currency experiences heavy selling pressure (also called exchange market pressure or a speculative attack). There are a number of possible indications of selling pressure. One is substantial losses in the foreign reserves held by a country's monetary authority (the central bank or other body that issues the foreign currency). Another is depreciating exchange rates in the forward market, where buyers and sellers promise to exchange currency at some future date rather than immediately. Still another indication of selling pressure is a depreciating black-market exchange rate, if restrictions on trading foreign currencies have led to the existence of a black market. Finally, in extreme cases where inflation is high, selling pressure may show up as a general flight out of domestic currency into foreign currency or into goods that people expect will retain value, such as gold, real estate, or bricks.

A currency crisis is one type of financial distress. Sometimes currency crises happen in conjunction with other kinds of financial distress, such as bank runs, but other times they are limited to the foreign-exchange market. Because currency crises have distinctive features, they can be analyzed separately, and to understand them one need not undertake the large task of developing a general analysis of financial distress.

A currency crisis is resolved when selling pressure ends, which can be through one or more of the following methods:

- Devaluation (setting a new official exchange rate that requires more units of local currency to buy a unit of foreign currency).
- Floating (allowing buyers and sellers in the foreign-exchange market to determine the exchange rate rather than having the government set it at any particular level).
- Imposing exchange controls (restricting people's ability to buy foreign currency; over time, exchange controls tend to lose effectiveness as people find loopholes).

¹ Major crises have occurred in the European Monetary System (1992-3), Africa's CFA franc zone (1993-4), Mexico (1994-5), East Asia (1997-8), Russia (1998), Brazil (1999), Turkey (2001), and Argentina (2001-2). For descriptions of these crises, see JEC (2001), pp. 17-19. Minor crises have occurred in such widely separated countries as India (1995), Kenya (1995), the Czech Republic (1997), Ukraine (1998-9), Ecuador (1999), and South Africa (2001).

- Obtaining a loan from the International Monetary Fund (IMF) or other sources to bolster the foreign reserves of the central bank, so the monetary authority has more funds to buy back local currency.
- Restoring confidence in the currency, such as by announcing appropriate and credible changes in monetary policy.

The cost of currency crises. Currency crises can create large losses. A study of 56 countries found that currency crises from 1993 to 1997 made the growth of gross domestic product (GDP) 5.9 percentage points lower than otherwise. That is like losing one or two years of economic growth in most countries. “Twin crises”—currency crises combined with banking crises—reduced the expected growth of GDP by a staggering 18.6 percentage points.²

Common features. A previous Joint Economic Committee staff report reviewed the history and features of major recent currency crises.³ As the report noted, a striking characteristic is the lack of common features. Often currency crises occur in connection with bank failures, political turmoil, or other problems. Sometimes, though, they seem to arise out of nowhere and end with little effect outside the foreign-exchange market. The only feature common to all the major recent crises, and to many minor crises, is that the crises began in or were worst in countries that had “pegged” exchange rates.

Types of exchange rates. There are three broad categories of exchange rate flexibility: at one extreme, floating rates; at the other, fixed rates; in between, intermediate arrangements that here will be called “pegged.”⁴ Under a *floating* exchange rate, the exchange rate is not maintained constant in terms of any anchor currency. The U.S. dollar is an example of a currency that floats fairly “cleanly,” without the Federal Reserve System or the U.S. Treasury intervening frequently to influence its exchange rate by buying or selling foreign currency.⁵

Under a *fixed* exchange rate, a currency is maintained constant in terms of an “anchor” currency. The monetary authority, if any, has no discretionary power to vary the amount of money that it issues. That amount changes only in response to changes in demand by the public. An example of a country with a fixed rate is Panama, which uses U.S. dollars as currency and issues no notes (paper money) of its own. Observe also that exchange rates are fixed *within* a single country or within a group of countries using a single currency, such as the twelve Western European countries that use the euro.

² Bordo and others (2001), p. 59, Table 1.

³ JEC (2001).

⁴ Economists still lack a generally agreed set of terms and classifications for exchange rates. Some economists do not distinguish between fixed and pegged rates, reducing the broad categories of flexibility to two: fixed or pegged on the one hand, and floating on the other hand. Other economists use the terms “super fixed” and “fixed,” “pegged” and “intermediate,” or “hard pegged” and “soft pegged,” to signify the difference between what this paper calls fixed rates and pegged rates. In popular usage, an exchange rate is often called pegged if it has persisted only a short while, and fixed once it has persisted longer. This study distinguishes between pegged and fixed exchange rates based on how they work, not how long they last.

⁵ For details of the interventions, see Federal Reserve Bank of New York (various dates).

Under a *pegged* exchange rate, the fluctuation of the currency is maintained within limits, but unlike the case with a fixed rate, the monetary authority has discretionary power to vary the amount of money it issues. The limits of fluctuation for the exchange rate may be narrow or wide, and may shift over time. The Malaysian ringgit is an example of a currency with a “hard” pegged rate: since September 1998, the Malaysian central bank has maintained the exchange rate continuously at 3.8 ringgit per dollar. The pegged exchange rate is supported by exchange controls.

The reason for dividing exchange rates into these three categories is that, as we will see, they correspond to important differences in the way the money supply works—differences crucial for explaining patterns in currency crises. Observers who fail to make the distinctions cannot explain important aspects of the patterns and derive misleading lessons for economic policy.⁶

II. SHORTCOMINGS OF SOME IDEAS ABOUT CURRENCY CRISES

Before suggesting an explanation of why currency crises happen, it may be useful to review ideas about currency crises that have support in certain quarters but are not particularly helpful for understanding crises.

A popular explanation: blaming speculators. Currency crises often arouse worries that big currency speculators have manufactured the crises for their own profit. The world’s best-known currency speculator, George Soros, made \$2 billion in 1992 by speculating against the currencies of the European Monetary System during its crisis. The prime minister of Malaysia, Mahathir Mohamad, blamed Soros and other speculators for spreading the Asian currency crisis to his country in 1997, and branded Soros a moron.⁷

Because of limitations in data, it is hard to determine how much influence the big currency speculators have in foreign-exchange markets, though case studies indicate that during some episodes their influence has been considerable.⁸ For speculators, big size can mean enormous losses as well as enormous profits. George Soros and another famed speculator, Julian Robertson, both retired in 2000 after suffering the consequences of unsuccessful large speculations. In little more than a year, a hedge fund run by Soros lost more than \$2 billion, and one run by Robertson lost more than \$16 billion.⁹

Currency speculation is not just an activity of multibillion-dollar hedge funds, though. In countries with a history of monetary instability, millions of ordinary people also speculate. They include people so far outside the formal financial system as to lack bank accounts; their speculation takes the form of holding foreign currency in their wallets or under their mattresses. In combination, millions of small speculators can move markets as much as the big speculators do.

⁶ For example, Labonte (2001).

⁷ Kaletsky (1992), Mahathir (1997), Penna (1997).

⁸ Financial Stability Forum (2000), pp. 127-42; see also Corsetti and others (2001).

⁹ Lewis and Chaffin (2000), Pruzan (2001).

Currency speculation happens all the time, in almost all of the world's currencies. Speculators play a role in making currency crises unfold as they do, but the important question for economic policy is whether speculators can make a crisis happen without a pre-existing flaw in exchange rate policy. Why hasn't the United States suffered a currency crisis for many years, even though the dollar is the most widely used currency in international currency speculation? Why do countries almost never suffer internal currency crises, where, say, a dollar in a bank account in New York is only worth 95 cents if the account holder wants to transfer the funds to San Francisco? Simply blaming speculators for currency crises cannot answer such questions.

Academic models: the first generation. Academic economists have in the last 25 years expended much effort on developing mathematical models of devaluations of pegged exchange rates.¹⁰ Work from the late 1970s to the mid 1990s, which in retrospect has been termed first-generation models, focused on explaining the *timing* of currency crises rather than their *causes*. The first-generation models gave a plausible explanation for an important feature of many currency crises: speculative attacks and devaluations usually happen well before central banks exhaust their foreign reserves. In these models, the central bank increases the money supply, or at least is expected to increase it, without a corresponding increase in foreign reserves; one reason could be that the central bank is funding deficits in the government budget. Speculators continue to hold assets in local currency as long as the expected rate of return is higher than the expected rate on assets in foreign currency. When they perceive that a large demand to exchange local currency for foreign currency would reduce foreign reserves below some target level the central bank desires, they sell local currency. If they time the attack correctly, they avoid exchange-rate losses. The central bank, however, now has a level of foreign reserves it considers insufficient to defend the pegged exchange rate, so it devalues.

In first-generation models, poor economic "fundamentals" such as budget deficits financed by inflation underlie the story. A practical implication of the models is that the most important task in preventing or resolving crises is to fix government finances or other "fundamentals" such as a weak banking system, rather than to fix monetary policy. Monetary policy is important, but it will work well only if the fundamentals are good. IMF programs seem based on this view. For example, the agreement the IMF made with Turkey in May 2001, granting credit of up to \$19 billion, contains 47 paragraphs. The agreement does not discuss monetary policy until paragraphs 40 to 43, after the banking system, the government budget, taxation, government debt, privatizing government-owned enterprises, and changing incentives for foreign investment.¹¹

First-generation models seemed to capture the essentials of many currency crises up through the 1980s. However, in the European Monetary System, budget deficits in the countries affected by the currency crisis of 1992-3 seemed small and sustainable, except in Finland and Italy. In East Asia, most countries affected by the currency crisis of 1997-

¹⁰ For longer summaries of developments in modeling currency crises under pegged exchange rates, see Flood and Marion (1999) and Jeanne (2000). The most influential first-generation model is Krugman (1979).

¹¹ Turkey (2001), IMF (2001).

8 had been running budget *surpluses* and enjoying rapid economic growth. The search to explain crises that looked much different from those in the first-generation models created interest in so-called second-generation models.

Academic models: the second generation. The second-generation models focus on how changes in expectations can cause crises. Expectations can change without a change in fundamentals as people become aware of new ideas or fall prey to new fears. In the second-generation models, a pegged exchange rate that is sustainable under some circumstances can be unsustainable in others. For example, if people think the government may devalue the currency in response to high unemployment, speculative attacks will not occur when unemployment is low, but will become frequent if unemployment rises. They also may become frequent if something happens that *might* drive unemployment higher. The trigger for a speculative attack may be a seemingly unimportant event. As the attack develops, the fundamentals may not deteriorate in a predictable way, unlike the case in first-generation models. Self-fulfilling panic by speculators rather than deterioration of economic fundamentals may drive currency crises. The second-generation models imply more pessimism than the first-generation models because they are skeptical that maintaining a short list of good economic “fundamentals” prevents crises.

Since the Asian currency crisis of 1997-8, a new class of models has been devised that emphasizes how weak financial systems can contribute to currency crises. Under these models, for example, weak banks can trigger speculative attacks if people think the central bank will rescue the banks even at the cost of spending much of its foreign reserves to do so. The explicit or implicit promise to rescue the banks is a form of moral hazard—a situation in which people do not pay the full cost of their own mistakes. The recent models have sometimes been termed third-generation, but they are more accurately seen as elaborations of the second-generation approach.¹²

The second-generation models are intellectually intriguing, but their relevance for explaining actual crises is questionable. They risk becoming accounts in which “anything goes.” The academic models more generally talk around currency crises rather than getting to the core of what causes them: the particulars of exchange rate arrangements and the monetary authorities that maintain those arrangements.¹³

III. A SUGGESTED EXPLANATION BASED ON SUPPLY AND DEMAND

Ideas about currency crises that blame speculators, or that focus on factors outside of foreign-exchange markets, neglect a way of explaining currency crises that is simple

¹² Perhaps the most influential second-generation model is Obstfeld (1986); a representative third-generation model is Corsetti and others (1998).

¹³ Andrew Rose, a professor at the University of California-Berkeley, has written, “As a profession, we [economists] simply do not have a very good understanding of what causes crises (especially currency crises). We are therefore unable to provide policy-makers with good crisis prevention techniques, early warning systems, and so forth. Theory is ahead of empirics in this area of economics, but both are in terrible shape.” Rose (2001), p. 75.

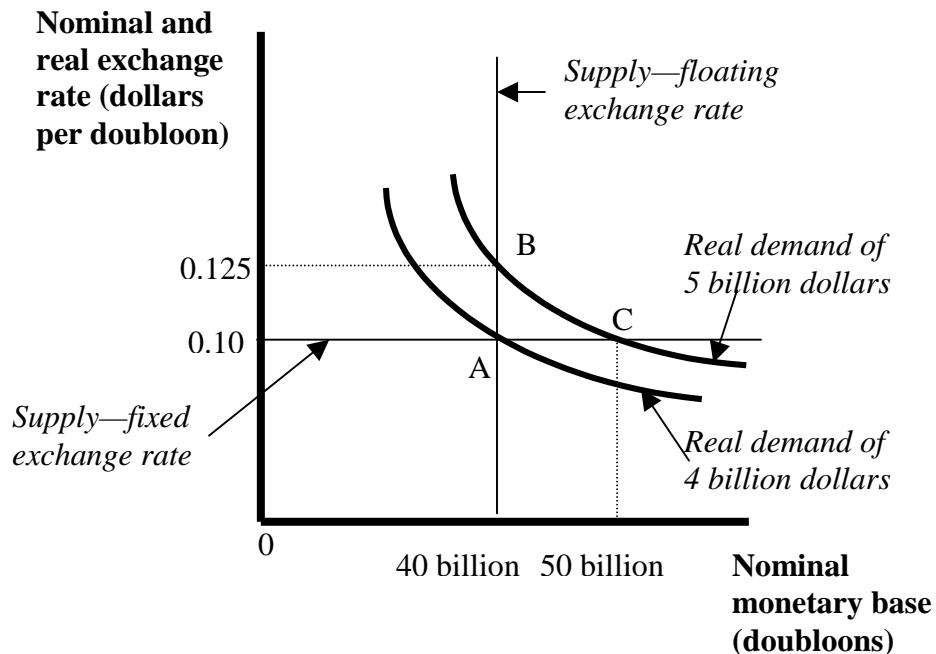
yet intellectually satisfying because it relies on elementary economic concepts of supply and demand—in this case, supply of, and demand for, a currency. According to this alternative explanation, currency crises originate from governments' inconsistent exchange rate policies.

The real supply of, and demand for, money. The alternative explanation has three building blocks: the demand for money (a particular currency), the supply of money, and the foreign exchange market as an arena where changes in supply and demand play out.

Consider first the demand for money. The demand for money is fundamentally a demand for a specific real amount of money. (“Real” means adjusted for inflation or other changes in value. The opposite of real is “nominal,” which means unadjusted for changes in value.) That does not mean people always perceive inflation correctly or that the real demand for money is always the same; it just means that people care more about the purchasing power of their money than they care about the nominal amount they hold. So, if the U.S. government introduces a currency called a “new dollar” that is equal to 100 old dollars, people will reduce their nominal holdings of dollars to about one-hundredth the old value. It is like changing the accounting unit from pennies to dollars.

Now consider the supply of money. Money is issued by monetary authorities, such as the Federal Reserve System. They issue the form of money called the monetary base, which is accepted as final payment in the domestic monetary system. In the United States, the monetary base comprises notes and coins issued by the Federal Reserve System plus deposits of banks at the Federal Reserve. The monetary base is the narrowest form of the money supply. The Fed controls the *nominal* supply of the monetary base, and thereby influences broader measures that include bank deposits, etc. However, the Fed does not control the *real* supply of the monetary base or of broader measures of the money supply. The *real* supply of money is the nominal supply (for the United States, the number of dollars) times the purchasing power of each unit (how much each dollar can buy). The purchasing power of a unit of money depends on how much people are willing to pay for various goods—something that is beyond the control of the monetary authority.

The public's real demand for money changes from time to time because of many factors. As an example, take the case of the small, hypothetical country of Doubloonland, which issues a national currency called the doubloon. Suppose that the real supply and real demand for doubloons are initially equal, but that the real demand then increases. The real supply can increase to become equal to the real demand again in two ways. One is for the nominal supply of doubloons to increase while the purchasing power of each dollar stays the same. The other way is for the nominal supply of doubloons to stay the same while the purchasing power of each dollar rises. (These are the extreme, simple cases; there is also an intermediate case where both the nominal supply of doubloons and the purchasing power of each doubloon increase a bit.)

Figure 1. Real supply and demand for money

When the real demand for doubloons falls, the real supply of doubloons can again become equal to the real demand again in one of two ways. The nominal supply of doubloons falling while the purchasing power of each doubloon stays the same, or by the nominal supply of doubloons staying the same while the purchasing power of each doubloon falls. (Again, there is also an intermediate case where both the nominal supply of doubloons and the purchasing power of each doubloon decrease a bit.)

Figure 1 shows how these changes in demand play out in the foreign-exchange market. For simplicity, the figure assumes that the foreign currency in question, the dollar, has a stable purchasing power.¹⁴ The vertical axis in Figure 1 is the nominal exchange rate (the value of each doubloon expressed in dollars), which in a sense is the “price” of money; the horizontal axis is the nominal monetary base, which is the quantity. The curve that passes through point A comprises all the combinations of the exchange rate and the nominal monetary base that equal 4 billion dollars of purchasing power, while the curve that passes through points B and C comprises all the combinations that equal 5 billion dollars of purchasing power.

¹⁴ If instead the purchasing power of the dollar is variable, changes can come from the side of real supply as well as the side of real demand, but the way nominal supply adjusts to real demand remains similar.

When people's real demand for the monetary base increases, they respond by not spending as much. Higher real demand for the monetary base in Doubloonland means lower demand for other goods. Sellers of those goods respond by cutting prices. That means prices in Doubloonland are now lower than prices of similar goods in the United States. Americans (and other foreigners) have an incentive to exchange dollars for doubloons so they can buy the now-cheaper goods in Doubloonland. (The goods can include financial assets; in fact, most international arbitrage today occurs through financial assets rather than tangible goods like wheat or automobiles.)

If the exchange rate between the doubloon and the dollar is floating, the effect of Americans selling dollars to buy doubloons is to make the exchange rate of the doubloon appreciate, that is, it takes fewer doubloons to buy a dollar. In Figure 1 the vertical line passing through points A and B represents the simplest kind of floating exchange rate, in which the doubloon monetary base (the nominal supply) is frozen at 40 billion doubloons. An increase in the real demand for doubloons from the equivalent of 5 billion dollars (point A) to the equivalent of 5 billion dollars (point B) makes the value of each doubloon rise from 0.10 dollars (= 10 doubloons per dollar) to 0.125 dollars (= 8 doubloons per dollar).

If the exchange rate between the doubloon and the dollar is fixed rather than floating, the effect of Americans selling dollars to buy doubloons is to increase the doubloon monetary base (which is, again, the nominal supply). In Figure 1 the horizontal line passing through points A and C represents the simplest kind of fixed exchange rate, in which the doubloon monetary base is backed 100 percent by dollars. An increase in the real demand for doubloons from the equivalent of 4 billion dollars (point A) to the equivalent of 5 billion dollars (point C) makes the doubloon monetary base increase from 40 billion doubloons to 50 billion doubloons.

So far we have considered what happens when the real demand for money increases. When the real demand for money decreases, the processes just described reverse. When people's real demand for the monetary base decreases, they respond by spending more. Lower real demand for the monetary base in Doubloonland means higher demand for other goods. Sellers of those goods respond by raising prices. That means prices in Doubloonland are now higher than prices of similar goods in the United States. Residents of Doubloonland have an incentive to exchange doubloons for dollars so they can buy the now-cheaper goods in the United States and elsewhere abroad. Under a floating rate, the exchange rate goes from 0.125 dollars per doubloon (= 8 doubloons per dollar) to 0.10 dollars per doubloon (= 10 doubloons per dollar) as the real demand for the doubloon monetary base falls from B to A. Under a fixed exchange rate, the exchange rate stays at 0.10 dollars per doubloon, but the monetary base falls from 50 billion doubloons to 40 billion doubloons as real demand falls from C to A.

Adjustment under floating, fixed, and pegged exchange rates. Of the three basic types of exchange rates—floating, fixed, and pegged—we have discussed pegged rates little until now. The defining feature of a pegged rate is “monetary sterilization,” also known as “sterilized intervention.” Sterilized intervention occurs when the monetary

authority (typically a central bank) offsets its dealings in the foreign-exchange market with dealings in domestic securities that leave the monetary base unchanged.

Under a “clean” *floating* exchange rate, the central bank does not try to influence the exchange rate at all. It can stay out of the foreign-exchange market, which is on autopilot. Under a *fixed* exchange rate, when the foreign reserves of the monetary authority increase as a result of people buying or selling foreign currency to it, the monetary base increases in a fixed proportion, and when foreign reserves decrease, the monetary base decreases in a fixed proportion. The monetary base is on autopilot.¹⁵

Under a *pegged* exchange rate, in contrast, neither the foreign-exchange market nor the monetary base is on autopilot. For example, if the real demand for the monetary base in Figure 1 falls from the equivalent of 5 billion dollars to the equivalent of 4 billion dollars, the central bank may respond by not allowing the monetary base to fall at all. It can do so, temporarily, by letting its foreign reserves fall faster than the monetary base.

The sterilized intervention characteristic of a pegged exchange rate allows the central bank to control the real supply of money for a time and to hinder the real supply from adjusting to changes in the real demand.¹⁶ The delay reduces the accuracy of prices as signals for guiding economic activity. Consider the case where the central bank prevents the doubloon monetary base from falling when real demand for it falls. The central bank maintains in circulation 10 billion more douloons than people want. A consequence is that goods become more expensive in Doubloonland than abroad and people exchange douloons for dollars to buy now-cheaper foreign goods. The cycle continues as long as the central bank refuses to reduce the monetary base. The central bank eventually loses so many foreign reserves it either must finally reduce the monetary base or it must abandon the pegged exchange rate and go to a floating rate. The structure

¹⁵ Some economists have claimed that fixed rates are a form of price fixing, and therefore not as market-oriented as floating rates. However, floating rates involve limiting the supply of money through *quantity* fixing if they are to avoid high inflation. Being market-oriented does not depend on whether the exchange rate is fixed or floating, but on the extent to which competition is allowed in supplying money and credit.

¹⁶ A central bank can sterilize when demand for the local currency rises as well as when it falls. Sterilizing when demand rises makes local prices lower and interest rates in local currency higher than they would otherwise be, encouraging a greater inflow of foreign capital than would otherwise occur. For flows of foreign capital to return to their “normal” level, outflows must be larger than they would have been had inflows not been sterilized. By delaying adjustments in prices and interest rates, sterilized intervention tends to make both inflows and outflows sources of greater volatility than they would otherwise be.

The analysis here is in terms of the monetary base because it is the part of the money supply that the monetary authority controls directly. For broader measures of the money supply, the counterpart to sterilized intervention is “financial repression”—measures that prevent financial institutions from changing the supply of credit in response to demand. Examples include interest-rate ceilings, differential reserve requirements, and regulations that direct credit to politically favored sectors.

The case against sterilized intervention applies only to monopoly issuers of currency. When competing commercial banks change their liabilities in the opposite direction from their reserves, it should not be considered sterilized intervention, but an attempt to forecast demand for liabilities correctly and thereby maximize profits. The price and quantity signals generated by competition tend to make commercial banks that overexpand correct their mistakes faster than a central bank. For more on sterilized intervention, see Schuler (1999), pp. 85-90.

of prices that existed during the period of sterilized intervention contains mistakes that must now be corrected, perhaps at the cost of a recession.

In contrast, under a clean floating exchange rate or a fixed exchange rate, the monetary authority does not hinder the real supply of money from adjusting to the real demand. Although a clean floating rate and a fixed rate differ in the way adjustment occurs, both allow quicker adjustment than occurs with a pegged rate.

Currency crises force necessary adjustments. Mistakes in targeting the real supply of money create opportunities for arbitrage in foreign-currency markets and elsewhere: the bigger the mistakes, the bigger the opportunities. Monetary authorities that in effect target the real supply of money by maintaining pegged exchange rates encourage speculative pressure to build until it forces a devaluation.

Currency crises can be viewed as the foreign-exchange market's way of forcing adjustment of the real supply of money to the real demand when the monetary authority is trying to prevent it. The absence of sterilized intervention does not mean that adjustment will always be smooth; it might be painful. However, the likelihood is that it will be even more painful with sterilized intervention because price signals are likely to become less accurate.

How much sterilization has to occur for the exchange rate to qualify as pegged? In a broad sense, any time a monetary authority conducts sterilized intervention, it is engaging in a form of pegging, even if only for a short period. The exchange rate need not be rigid, like the rate of 10 doubloons per dollar in the example. If a central bank claims that it has a floating rate but it engages in extensive sterilized intervention, in effect it has a very wobbly peg. A number of central banks fit this description.¹⁷

How effective sterilized intervention is and how long it can last depend on a number of factors. Sterilized intervention affects real economic activity most when local currency and foreign currency are not close substitutes. Sterilized intervention can last longer the more foreign reserves of the monetary authority has in relation to the foreign-exchange market for the local currency. These considerations imply that sterilized intervention can last longest in countries with large foreign reserves that are outside the mainstream of international finance because they attract little foreign investment or impose extensive exchange controls. The U.S. Treasury and Federal Reserve occasionally coordinate sterilized interventions, giving the dollar a slightly "dirty" floating exchange rate, but their foreign reserves are tiny in relation to foreign-exchange trading in the dollar.¹⁸ They use sterilized interventions more as ways to signal financial markets of their plans for the future rather than as attempts to influence today's trading by buying or selling in massive amounts.

¹⁷ Calvo and Reinhart (2000) call such policies "fear of floating."

¹⁸ As of June 2001, the Federal Reserve had \$14.4 billion of foreign-currency holdings and the Treasury's Exchange Stabilization Fund had \$14.4 billion. Federal Reserve Bank of New York, November 2001, p. 10. Average foreign-exchange trading involving dollars was estimated at more than \$1 trillion a day in April 2001. Galati (2001), p. 43.

How currency quality affects the real supply of money. We have considered the real supply and real demand for money as adjusting in two dimensions, price (exchange rate) and quantity. There also exists a third dimension, quality, that is usually neglected. For a currency, an important aspect of quality is convertibility—the ability to use the currency to buy foreign goods, including foreign currencies. A fully convertible currency such as the dollar has no restrictions preventing people from using it to buy foreign currencies with it. An nonconvertible currency such as the Cuban peso is almost impossible to use to buy foreign currencies legally, though many countries with nonconvertible currencies have black markets in foreign exchange.

Restricting a currency's convertibility is like reducing its supply as far as the legal foreign-exchange market is concerned. However, restricting convertibility is inferior to other methods of reducing the real supply of money as a response to a decrease in the real demand. Restrictions on convertibility hinder trade, reducing the accuracy of prices as signals to guide economic activity. Countries that restrict the convertibility of their currencies for long periods have often found the effects to be quite distorting. Simple items such as imported toothpaste or cigarettes become luxuries sold only in the black market, and anyone who deals with foreigners tries to get paid in foreign rather than domestic currency.

IV. CONSISTENCY IN EXCHANGE RATE POLICY

The “impossible trinity” of goals for monetary policy. Exchange rate policy is the external (foreign trade and investment) part of monetary policy. In monetary policy, three goals are often considered desirable: stability, convertibility, and independence. Stability is typically thought of in terms of a constant exchange rate with a suitable anchor currency or commodity, to keep inflation low and promote trade with other countries anchored to the same currency. Convertibility means lack of exchange controls, to enable investment to flow wherever it yields the highest benefit. Independence means a degree of discretionary power in setting monetary policy, and is typically considered desirable because it may allow the monetary authority to insulate the economy somewhat from external shocks.

The three goals have been termed the “impossible trinity” because it is possible to achieve at most only two of them simultaneously, fully, and consistently.¹⁹ Maintaining a constant exchange rate and full convertibility implies that monetary policy cannot be independent, because in such circumstances the supply of money is determined internationally (as in Panama, which uses the U.S. dollar as its national currency). Having some independence in setting monetary policy therefore implies either sacrificing a constant exchange rate (like the United States since the early 1970s) or sacrificing full convertibility (like China, which pegs the yuan to the dollar but restricts the buying and selling of foreign currencies).

¹⁹ Economists of earlier generations who understood the conflict among these goals include Viner (1937, pp. 286-8) and Scrope (1833, pp. 41-2), who was aware of its link to sterilized intervention.

It is possible to achieve all three goals at once, for months or even years at a time, in partial fashion. However, such combinations are unstable in the long run because they are internally contradictory. A pegged exchange rate with substantial convertibility is a prime example of an unstable combination. Under a truly fixed exchange rate with full convertibility, a country has no independence in setting monetary policy. Under a pegged exchange rate, on the other hand, a country has some independence, in the form of the central bank's capacity for sterilized intervention. Sterilized intervention enables the central bank to leave unchanged its issue of local currency even when losses of foreign reserves signal lower demand for local currency. However, if the central bank persists in refusing to reduce its issue of local currency, it will eventually lose all its foreign reserves. It must choose among abandoning the exchange rate, restricting convertibility by imposing exchange controls, or giving up independence in monetary policy by allowing the money supply to shrink. Politically, devaluation is usually easiest because it can be done fastest and can be blamed on external forces.

In principle, restricting convertibility enables a country to combine stability and independence, the other two goals. Over time, though, exchange controls lose effectiveness unless enforced by an intrusive bureaucracy, because evading them is profitable. Over the long run, the options for monetary policy are therefore narrower in practice than in principle.

The “consistent trinity” of options for monetary policy. The counterpart of the “impossible trinity” is what might be called the “consistent trinity.” The first member of the trinity is a floating exchange rate, supported by a credible commitment to low inflation. Sterilized intervention can occur, but if it becomes persistent, the exchange rate becomes in effect a type of pegged rate. A problem with a floating rate is how to make it credible. The United States and other developed countries have done it, but very few developing countries have.

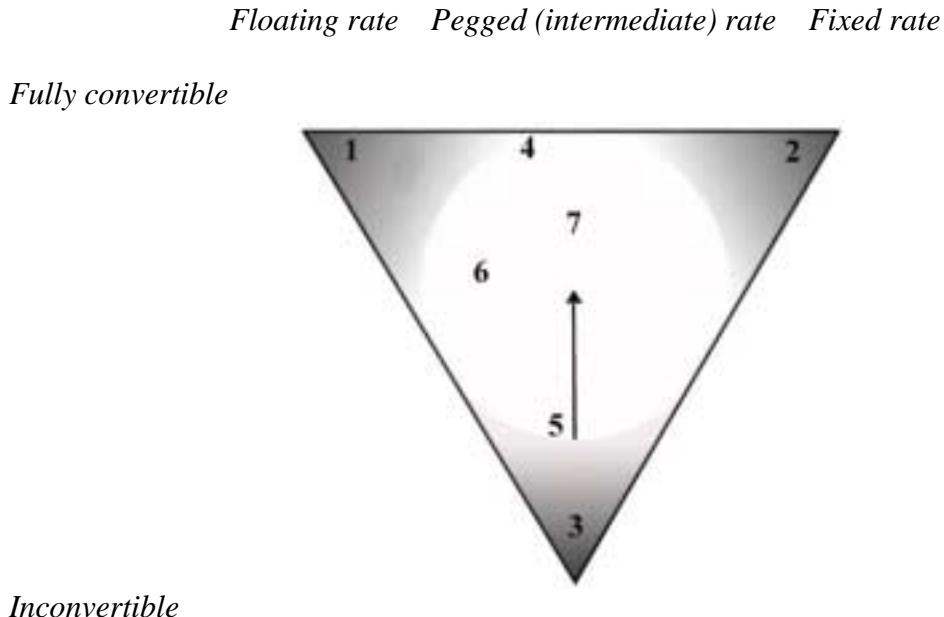
The second member of the trinity is a truly fixed exchange rate. Monetary policy focuses on maintaining the exchange rate and no sterilized intervention occurs.

The third member of the trinity is an exchange rate that may officially be described as fixed, pegged, or floating, but has such extensive restrictions on convertibility that a more accurate description would be to call it “controlled.” A controlled exchange rate only makes sense over the long term for centrally planned economies; for countries that wish to be market economies it can only be a temporary policy, so for them the consistent choices reduce to floating or fixed exchange rates.

Figure 2 represents the “consistent trinity” as the corners of the triangle. The farther away from the corners monetary policy is, the greater the inconsistency of monetary policy and the greater the chance it will lead to a currency crisis.

Exchange rates and monetary authorities. Both logic and historical experience indicate that not every kind of monetary authority is capable of maintaining every kind of exchange rate policy, whether the policy is consistent or inconsistent.

Figure 2. Consistent and inconsistent options for monetary policy



The consistent corners (shaded):

- 1 Floating rate, fully convertible: major central banks, plus some others (United States, European Central Bank [with respect to outside currencies], Japan, New Zealand).
- 2 Fixed rate, fully convertible: dollarization (Panama, Ecuador), orthodox currency boards (Cayman Islands). A multinational central bank (such as the European Central Bank) has fixed exchange rates among its member countries, though central banks typically do not maintain fixed exchange rates to outside currencies.
- 3 “Controlled” rate, inconvertible: centrally planned economies (Cuba, North Korea). A controlled rate can be officially fixed, pegged, or floating, but in practice the difference is hard to tell.

Borderline cases:

How much leeway is there to avoid inconsistency is there as one moves from the corners toward the center? Systems near the borderline include:

- 4 Currency board-like systems (Argentina 1991-2002, Hong Kong).
- 5 Pegged exchange rates with strong but not airtight exchange controls (China).

The inconsistent middle (white):

- 6 Hard pegged exchange rates with substantial convertibility (Malaysia).
- 7 Crawling bands (Turkey before its 2001 currency crisis).

The *arrow* indicates that without an intrusive bureaucracy to enforce them, exchange controls tend to break down over time as people find ways around them. The bottom corner of the triangle therefore tends to move up, narrowing the range of options.

Source: Apparently the first diagram like this is in Oxelheim (1990), p. 10.

Most countries today have *national central banks*, such as the Federal Reserve System. However, other types of monetary authorities exist.²⁰ Some countries belong to *multinational central banks*; the most prominent is the European Central Bank, which issues the euro. A few countries have *currency boards*, which issue the monetary base in a rule-bound manner with no discretion. The rules that bind an orthodox currency board are a fixed exchange rate with an anchor currency and a requirement to hold 100 percent foreign reserves against its monetary liabilities. A few other countries have *currency board-like systems*, which allow an element of discretion in monetary policy that orthodox currency boards lack. Discretion typically comes through relaxing the requirement of 100 percent foreign reserves, by allowing the reserve ratio to be lower or higher. A few dozen countries have *official dollarization*, which means using the U.S. dollar or some other foreign currency to largely or fully replace national currency as the monetary base. Ecuador and El Salvador have recently joined the ranks of officially dollarized countries.

The historical experience of dollarization, currency boards, and (in a qualified sense) multinational central banks has been that they have succeeded in establishing and preserving fixed exchange rates. It appears that none of the more than 70 dollarized systems have ever devalued, and among more than 70 countries with currency boards only one ever has (Argentina, in 1914 and 1929). No multinational central bank has devalued or floated its currency in one member country as opposed to others, though like other central banks they have typically not maintained truly fixed exchange rates against other currencies. Also, countries have on occasion ended their membership in multinational central banks and established national central banks that have later devalued or floated their new national currencies.

In contrast to the success of systems that maintain truly fixed exchange rates, the historical experience of central banks trying to maintain pegged exchange rates has been that pegs have collapsed in devaluation or floating. Under the Bretton Woods international monetary system (1945-71), when pegged exchange rates collapsed they would typically be devalued, that is, repegged at a more depreciated level. More recently, when pegged exchange rates have collapsed they have usually been replaced by floating rates, although in some cases floating has not lasted long, leaving many countries to bounce back and forth between floating and pegging. Only about 15 percent of pegged exchange rates maintained by central banks have never been devalued.²¹

Differences in the design of various monetary authorities explain their contrasting performance. Currency boards and dollarization are explicitly intended to maintain fixed exchange rates, not floating or pegged rates. Currency boards, have rules that make sterilized intervention impossible for the monetary authority. Dollarization eliminates the national monetary authority entirely. A multinational central bank substitutes a single

²⁰ For a list of which countries have which types of monetary authority, see JEC (2001), p. 8.

²¹ Schuler (1999), p. 86. In a recent discussion of exchange rate systems, the IMF in effect acknowledges that central banks cannot maintain fixed exchange rates by limiting the list of systems that can maintain fixed rates (which it calls “hard exchange rate pegs”) to “currency unions, the use of foreign currency as the only legal tender, and currency board arrangements.” IMF (2001a), p. 131.

international monetary authority for multiple national monetary authorities, establishing a single monetary policy and fixed exchange rates among its member countries, though not with respect to nonmembers. Sterilized intervention applies only with respect to foreign currencies, not to the single currency used by member countries.

Central banking is inherently a system of discretionary monetary policy, and as such inherently contrary to the spirit of fixed exchange rates. A central bank always has the *potential* to engage in sterilized intervention, even if it does not *actually* sterilize. Currency board-like systems also allow sterilized intervention, though the extent to which they have actually used it has varied widely from country to country. Argentina's devaluation of January 2002 starkly illustrates the problems of trying to mix a constant exchange rate with capacity for sterilized intervention.²²

Support for the “bipolar view” of exchange rate policy. The explanation of currency crises suggested here indicates that the extremes of fixed and floating rates are the only consistent exchange rate policies over the long term. This has been dubbed the “bipolar view” of exchange rate policy.²³ The desirability of the extremes is a bit counter to intuition: people usually think that given a choice, having a combination of two goods, such as cereal and milk, is better than having only or only the other. Pegged rates seem to offer such a combination: the capacity for sterilized intervention allows the central bank to combine some degree of exchange rate stability with some degree of independence in monetary policy. The problem with pegged rates is that the conflict of goals that they allow enables the monetary authority to get the real supply of money far out of line with the real demand, thereby providing the conditions for a currency crisis. It may be possible to delay the crisis for months or even years, but the underlying conflict remains.

V. POLITICS AND CURRENCY CRISES

Devaluation of pegged rates is ultimately a political choice. When a currency crisis happens under a pegged exchange rate, governments almost always have options other than devaluing or floating the currency, although the other options may involve economic pain that would not otherwise occur. (For example, a weak banking system may suffer a crisis that would not have occurred had the currency been devalued and the central bank rescued the banks.) The tendency of pegged exchange rates to allow the real supply of money to get far out of balance with the real demand explains why pegged exchange rates are particularly vulnerable to currency crises, but it does not make devaluation the only possible response. *Rather than being economically inevitable,*

²² Some observers identified the problems with Argentina's system long ago: see Hanke and others (1993), pp. 72-7. Over the course of 2001, the true foreign reserves of Argentina's central bank fell from a high of 193 percent of its monetary liabilities on February 23 to a low of 82 percent at year-end. See data from the Banco Central de la República Argentina at <<http://www.bcra.gov.ar/pdfs/estadistica/bas2001.xls>>, column F divided by column J. On January 6, 2002, Argentina ended its currency board-like system and devalued the peso from 1.00 to 1.40 per dollar.

²³ Fischer (2001). The bipolar view has been advocated for a number of years by a small but distinguished group of economists including Milton Friedman (1973, pp. 44-5); Pascal Salin (1990, p. 271), professor at the University of Paris; and Sir Alan Walters (1990, pp. 96-7), a former personal economic advisor to British prime minister Margaret Thatcher.

devaluation is at bottom a matter of political choice by governments—a choice based on factors that include but are not limited to considerations of economic welfare.²⁴

Economists' models of currency crises have had little to say about how different monetary arrangements influence the political decision to devalue or not when currency crises occur. The economic "fundamentals" and the role of expectations that play a role in bringing about currency crises differ under differing monetary authorities because the details of the arrangements influence their political durability.²⁵

Political influences on the timing of currency crises. Currency crises and devaluations are less likely near elections, because they are usually an embarrassment to the ruling party, which tries to prevent or at least delay them.²⁶

Crises are also more likely where they have occurred in the recent past, because those countries have often demonstrated lack of political will to correct their previous problems. Developing countries have historically been more prone to currency crises than developed countries, but even among developing countries some have better records than others. For example, Brazil and Chile both have central banks that maintain floating exchange rates. Brazil has improved its monetary performance enormously in the last ten years, but it continues to suffer currency jitters more often than Chile, which has had lower inflation than Brazil (usually much lower) in all but one of the last 20 years.

Frequent speculative attacks tend to erode political willpower to preserve a pegged rate, and unless a government is willing to eliminate the central bank and go to a fixed rate, devaluation eventually occurs. Russia and Brazil in 1998 and Turkey in 2000 all survived currency crises, but floated their currencies a few months later after further crises. A recent study analyzed currency crises in 90 developing countries from 1985 to 1998. Of the 90 countries, 46 countries (all with central banks) suffered a total of 88 crisis episodes; devaluations occurred in 42 episodes, or almost half. It appears that all except three of the countries in the study that had central banks maintaining pegged exchange rates have devalued or floated at some point since 1985, although the study did not specifically analyze this point.²⁷

Reducing direct political influence reduces inconsistency. Experience indicates that in general, the less direct influence governments have over day-to-day management

²⁴ Sometimes currency crises are presented as conflicts between economic goals of internal stability (especially economic growth or rescuing banks) and external stability (preserving the exchange rate) (Bordo and Schwartz 1996). In many cases, though, such as in the East Asian currency and Russian currency crises of 1997 and 1998, devaluation has been harmful both to internal and external stability, and policy makers may have suspected it would be. The list of goals included under "internal stability" needs to be broadened to include political goals, which may conflict with economic goals.

²⁵ Many second-generation models analyze the decision to devalue as the result of a calculation of costs and benefits by the central bank or the government, but do not discuss how different monetary arrangements may influence the costs and benefits. Drazen (2000) and Leblang (2000) contain models about how politics influences currency crises, but do not distinguish among different types of monetary authorities.

²⁶ Leblang (2000), pp. 3, 26.

²⁷ Leblang (2000), pp. 3, 51-2. The three exceptions are Barbados, Belize, and St. Lucia.

of monetary policy, the less likely it is that policy will pursue all three goals of the “impossible trinity” simultaneously, and the less likely it is that interest groups will make monetary policy a political football. Currency boards eliminate government influence over monetary policy by establishing strict and transparent rules for exchange rate policy. Dollarization eliminates it by eliminating a separate national currency.

Central banking typically offers more opportunity than currency boards or dollarization for governments to be heavily involved in the day-to-day management of monetary policy. For example, a substantial number of central banks must submit to control or participation by the treasury in setting exchange rate policy.²⁸ To reduce government influence, central banks have tried with varying success to gain a degree of political independence.²⁹ They have been most successful in gaining independence in advanced industrial nations. One way they have done so is by establishing explicit targets for monetary policy, as in Canada, where the Bank of Canada targets the inflation rate. Even if the targets are not legally binding, they offer some protection against political pressure because central banks can claim that yielding to pressure would cause them to miss the targets. The Federal Reserve does not have an explicit and well-defined target for monetary policy, but an informal consensus has developed that normally the Fed should keep inflation in the range of about 1 to 3 percent a year. The consensus has helped shield the Fed from political pressures that might lead to a less consistent monetary policy.

A multinational central bank such as the European Central Bank is likely to have more political independence than the national central banks it replaces because its fate is not in the hands of any single national government.

VI. CAUTION: CONSISTENCY ALONE MAY NOT SUFFICE

The most important currency crises of the last 10 years have all happened to currencies with pegged exchange rates. But though avoiding pegged rates and adopting one of the forms of consistent exchange rate policy reduces the likelihood that currency crises will happen, it may not eliminate crises. Currency crises can still happen if monetary policy or the political situation are highly unstable. Such crises are not crises in the narrow sense that happens under pegged exchange rates—an inability or unwillingness of the monetary authority to buy back as much of its currency as people want to sell at the pegged rate. They are crises in the broader sense of a general flight from domestic currency into foreign currency or into goods that people expect will retain value, such as gold, real estate, or bricks.

²⁸ A 1995 survey of 40 central banks in developing countries indicated that the exchange rate regime was determined solely by the government in 11 cases, jointly by the government and central bank in 22 cases, and by other means in 7 cases (for example, though a pegged exchange rate that predates the establishment of the central bank). See Fry and others (1996), p. 50. There seem to be no studies examining whether currency crises are more frequent where the central bank lacks full power to determine exchange rate policy, though one would expect more crises because the chance for conflicts of goals should be greater.

²⁹ On political independence, see Kleineman (2001).

Floating and fixed rates alike enable the real supply of money to change in accord with changes in the real demand. However, no exchange rate arrangement by itself guarantees that inflation will remain low. Keeping inflation low requires additional steps beyond choosing the type of exchange rate. Under a floating rate, low inflation requires implementing a strategy such as explicitly targeting the inflation rate. Under a fixed rate, low inflation requires selecting an anchor currency that itself has low inflation.

Currency crises under floating exchange rates. Under floating exchange rates, one type of currency crisis is the rapid depreciation that occurs during high inflations (those exceeding a threshold of 80 to 100 percent a year). The cause of high inflations is always that the central bank is creating or has recently created money at a fast rate. In such cases, it is obvious that the currency crisis originates from the side of the money supply, and that ending it involves reducing the growth rate of the money supply.

There is a large body of research on the high inflations; within it, exchange rate issues have received sufficient attention.³⁰ However, there seems to be no recent research directly concerning another type of currency crisis under floating exchange rates, in which highly variable demand for the currency is important.³¹ Floating allows the exchange rate to find its own level, but what is that level? Demand for a currency depends to a large extent on whether people expect it will have wide acceptance. If they expect nobody else will accept the currency, they will not accept it themselves. Confidence becomes all-important. The exchange rate can experience large swings, including currency crises, from changes in confidence. Depreciation can reduce confidence and therefore reduce demand, leading to further rounds of reduced confidence, lower demand, and further depreciation.

In such cases, political considerations are usually very important. For example, if people fear that a neighboring country will invade and declare the domestic currency worthless, it will start depreciating immediately, because by design a floating exchange rate carries no guarantee of exchangeability into a foreign currency or a commodity at any particular rate. Two recent cases where political uncertainty contributed to highly variable demand for the currency, resulting in large swings in foreign exchange rates, are Indonesia and Ecuador. Indonesia abandoned a loosely pegged rate under relatively calm conditions in August 1997, earning the praise of the IMF for its skillful handling of the situation.³² By early 1998, though, its currency, the rupiah, had depreciated from about 2,600 per dollar to as much as 16,000. (Today the exchange rate is about 10,000 rupiah per dollar.) The currency crisis led to the ouster of the authoritarian Suharto government. Ecuador abandoned a loosely pegged rate under turbulent conditions in January 1999. Its currency, the sucre, depreciated from about 7,000 per dollar to 25,000 per dollar before the government stabilized matters by announcing dollarization in January 2000.

³⁰ See Capie (1991).

³¹ There is some older material, such as Subercaseaux (1912), pp. 77-271. There is much recent research on the related topic of “currency substitution,” the partial displacement of domestic currency by foreign currency as a store of value, accounting unit, or means of payment. See Mizen and Pentacost (1996).

³² IMF (1997).

Currency crises under fixed exchange rates. Exchange rate crises can happen under fixed exchange rates for two main reasons. One is that the anchor currency becomes highly unstable. For example, when the Soviet Union dissolved in September 1991, the ruble did not become a currency jointly managed by all 15 former Soviet republics; rather, it became managed by the government of Russia alone. The other fourteen former republics were now “ruble-ized,” the ruble equivalent of being dollarized. They did not have currency crises with respect to their exchange rates against the ruble, but they experienced strong selling pressure of the ruble with respect to other currencies and with respect to goods because the ruble was highly inflationary. Inflation in Russia was 90 percent in 1991 and 2,600 percent in 1992, and the exchange rate of the ruble fell from 23 per dollar at the start of 1991 to 415 per dollar at the end of 1992. People all over the former Soviet Union dumped their rubles for dollars or goods. The rapid depreciation of the ruble spurred the other former Soviet republics to introduce new national currencies that they hoped would be more stable. (Some were, others were not.)

The other reason for a currency crisis is that the fixed exchange rate is expected to end. The United States had something of an exchange rate crisis leading up to the Civil War in 1861. The anticipated and later actual withdrawal of the southern states from the Union cut off many financial dealings between them and the northern states. The effects on northern banks, though short-lived, were severe enough that banks in Philadelphia and New York temporarily ceased paying out gold after Abraham Lincoln was elected president.³³ (The United States was on the gold standard at the time, and banks were obliged to convert deposits into gold for customers who requested it.)

VII. CONCLUSIONS

Currency crises happen for a reason. The ultimate cause of currency crises may be an underlying problem with the economy or economic policy, but the immediate cause of currency crises is inconsistent monetary policy. Currency crises are not ultimately caused by waves of panic that arise out of nowhere or by gangs of currency speculators. Problems with the economy or with economic policy may threaten to spill over into the currency, but governments have the choice of letting the spillovers happen or insulating the currency. One way of insulating the currency from crises is to choose a consistent exchange rate policy and match it with an appropriate monetary authority. Panic, when it arises, is based on an understandable fear that inconsistent monetary policies will continue. Currency speculators have no reason to speculate against a consistent monetary policy.

There is an economic basis for the vulnerability of pegged exchange rates. A pegged exchange rate is an unstable combination. The monetary authority, typically a central bank, is supposed to keep the exchange rate constant, but its power to engage in sterilized intervention allows the real supply of its currency to become far out of line with the real demand. Typically the result is an oversupply rather than an undersupply of money. The currency crisis that results is a painful adjustment, but one that under a

³³ Shultz and Caine (1937), p. 312.

pegged exchange rate is necessary to rebalance supply with demand. Floating and fixed exchange rates allow the real supply of money to adjust to the real demand more quickly.

There are different paths to avoiding currency crises. Countries that have avoided currency crises have done so by following different options among the “consistent trinity.” The United States and the countries issuing the other major international currencies have had floating exchange rates supported by credible commitments to low inflation. Not all floating currencies float as cleanly as the U.S. dollar, but the countries issuing the other major international currencies have avoided conducting so much sterilized intervention as to make their exchange rates in effect pegged.³⁴

Countries with dollarization (such as Panama) and orthodox currency boards (such as the Cayman Islands) have had fixed exchange rates. These countries and others that have been successful with such monetary authorities have been anchored to the U.S. dollar or another low-inflation currency rather than to a high-inflation currency. The member countries of the European Central Bank have established fixed exchange rates among themselves by replacing separate national currencies with a common multinational currency, the euro. Again, though, the euro itself is not fixed with respect to any outside currency.

Economies that are still centrally planned or have strong elements of government intervention throughout (such as Cuba and Myanmar) have had controlled exchange rates. They have avoided currency crises because they completely control the legal market for foreign currency. However, in the black market their currencies are worth much less than the official rate. The official exchange rate of the Cuban peso is one peso per dollar; the black-market rate is currently around 30 pesos per dollar. When Cuba liberalizes foreign-exchange trading, it will have to devalue the official exchange rate of the peso significantly to acknowledge the reality that the black-market rate reflects.

There are no guarantees, only probabilities. There is more than one cause of currency crises, and more than one way a currency crisis can happen. Following a consistent exchange rate policy eliminates one frequent source of currency crises: the inability or unwillingness of a monetary authority to buy back all of its currency that people want to sell at a pegged exchange rate. However, instability in monetary policy or in the political situation can still create currency crises. The exchange rate arrangement alone cannot solve those problems. What it can do is reduce the overall likelihood of currency crises by avoiding the dangers that are within its capability to avoid.

Kurt Schuler
Senior Economist to the Chairman

³⁴ A rationale for limited sterilized intervention under a floating exchange rate is to prevent a depreciating exchange rate from reducing confidence in the currency to such an extent that it starts a vicious cycle of further depreciation and further loss of confidence.

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