

CRS Report for Congress

Received through the CRS Web

Fixed Exchange Rates, Floating Exchange Rates, and Currency Boards: What Have We Learned?

Updated January 23, 2004

Marc Labonte
Analyst in Macroeconomics
Government and Finance Division

Fixed Exchange Rates, Floating Exchange Rates, and Currency Boards: What Have We Learned?

Summary

Congress is generally interested in promoting a stable and prosperous world economy. Stable currency exchange rate regimes are a key component to stable economic growth. This report explains the difference between fixed exchange rates, floating exchange rates, and currency boards/unions, and outlines the advantages and disadvantages of each. Floating exchange rate regimes are market determined; values fluctuate with market conditions. In fixed exchange rate regimes, the central bank is dedicated to using monetary policy to maintain the exchange rate at a predetermined price. In theory, under such an arrangement, a central bank would be unable to use monetary policy to promote any other goal; in practice, there is limited leeway to pursue other goals without disrupting the exchange rate. Currency boards and currency unions, or “hard pegs,” are extreme examples of a fixed exchange rate regime where the central bank is truly stripped of all its capabilities other than converting any amount of domestic currency to a foreign currency at a predetermined price.

The main economic advantages of floating exchange rates are that they leave the monetary and fiscal authorities free to pursue internal goals — such as full employment, stable growth, and price stability — and exchange rate adjustment often works as an automatic stabilizer to promote those goals. The main economic advantage of fixed exchange rates is that they promote international trade and investment, which can be an important source of growth in the long run, particularly for developing countries. The merits of floating compared to fixed exchange rates for any given country depends on how interdependent that country is with its neighbors. If a country’s economy is highly reliant on its neighbors for trade and investment and experiences economic shocks similar to its neighbors’, there is little benefit to monetary and fiscal independence, and the country is better off with a fixed exchange rate. If a country experiences unique economic shocks and is economically independent of its neighbors, a floating exchange rate can be a valuable way to promote macroeconomic stability. A political advantage of a fixed exchange rate regime, and a currency board particularly, in a country with a profligate past is that it “ties the hands” of the monetary and fiscal authorities.

Recent experience with economic crisis in Mexico, East Asia, Russia, Brazil, and Turkey suggests that fixed exchange rates can be prone to currency crises that can spill over into wider economic crises. This is a factor not considered in the earlier exchange rate literature, in part because international capital mobility plays a greater role today than it did in the past. These experiences suggest that unless a country has substantial economic interdependence with a neighbor to which it can fix its exchange rate, floating exchange rates may be a better way to promote macroeconomic stability, provided the country is willing to use its monetary and fiscal policy in a disciplined fashion. The collapse of Argentina’s currency board in 2002 suggests that such arrangements do not get around the problems with fixed exchange rates, as their proponents claimed.

This report will not be updated.

Contents

What Determines Exchange Rates?	1
Floating Exchange Rates	3
Hard Pegs and Soft Pegs	5
Currency Boards or Currency Unions	5
Economic Advantages to a Hard Peg	7
Political Advantages to a Currency Board or Union	8
Fixed Exchange Rates	10
Economic Advantages of a Fixed Exchange Rate	11
Political Advantages of a Fixed Exchange Rate	11
What Have Recent Crises Taught Us About Exchange Rates?	12
Appendix: How Interdependent Are International Economies?	20

List of Figures

Figure 1. Exchange Rates of Asian Crisis Countries	14
--	----

List of Tables

Table 1. Differences in Types of Currency Arrangements	7
Table 2. Economic Interdependence of Selected Developed Countries and Hong Kong	21
Table 3. Economic Interdependence of Selected Developing Countries	24

Fixed Exchange Rates, Floating Exchange Rates, and Currency Boards: What Have We Learned?

A prosperous world economy is beneficial to the American economy, especially given our robust international trade sector, and it is thought to bring political benefits as well, through its salutary effect on the political stability of our allies. Congress plays a role in promoting a stable and prosperous world economy. Congressional interest in currency exchange rates is twofold. First, Congress has an interest in determining the most appropriate exchange rate regime for the United States to promote domestic economic stability. Second, it has an interest in understanding and influencing the exchange rate regime choices of other nations. Stable exchange rate regimes are a key element of a stable macroeconomic framework, and a stable macroeconomic framework is a prerequisite to a country's development prospects. The collapse of a fixed exchange rate regime was central to every important international economic crisis since the mid-1990s — the 1994 Mexican peso crisis, the Asian economic crisis of 1997, the Russian debt default of 1998, the Brazilian devaluation of 1999, the Turkish crisis of 2001, and the Argentine crisis of 2002.

This reports evaluates the benefits and drawbacks of different types of exchange rate regimes from the perspective of their effects on macroeconomic stability. It focuses on three major types of exchange rate regimes: a floating exchange rate, a fixed exchange rate, and “hard pegs,” such as a currency board or a currency union. While there are permutations on these regimes too numerous to mention, a thorough understanding of these three will allow the reader to understand any permutation equally well. In the case of exchange rate regimes “one size does not fit all”; different countries have very different political and economic conditions that make some regimes more suitable than others.

What Determines Exchange Rates?

At times, the exchange rate is erroneously imagined to be an incidental value that can be sustained by the good intentions of government and undermined by the malevolence of greedy speculators. Economic theory holds it to be a value that is far more fundamental. It is the value at which two countries trade goods and services and the value at which investors from one country purchase the assets of another country. As such, it is dependent on the two countries' fundamental macroeconomic conditions, such as its inflation, growth, and saving rates. Thus, it is generally accepted that the value of the exchange rate cannot be predictably altered (for long) unless the country's macroeconomic conditions are modified relative to those of its trading partners.

Many view the volatility of floating exchange rates as proof that speculation and irrational behavior, rather than economic fundamentals, drive exchange rate values. Empirical evidence supports the view that changes in exchange rate values are not well correlated with changes in economic data in the short run.¹ But this evidence does not prove that economic theory is wrong. Although floating exchange rate values change frequently, and at times considerably, there are important economic conditions that change frequently in ways that cannot be measured. Factors such as investors' perceptions of future profitability and riskiness cannot be accurately measured, yet changes in these factors can have profound influence on exchange rate values. Economists have had more success at correlating long run exchange rate movements with changes in economic fundamentals.

A decision by a government to influence the value of its exchange rate, therefore, is likely to succeed only if its overall macroeconomic conditions are altered. Government does have tools at its disposal to alter aggregate demand in the short run — fiscal and monetary policy. Fiscal policy refers to increasing or decreasing the government's budget surplus (or deficit) in order to increase or decrease the amount of aggregate spending in the economy.² Monetary policy refers to increasing or decreasing short-term interest rates through manipulation of the money supply in order to decrease or increase the amount of aggregate spending in the economy.³ For example, other things being equal, lower interest rates lead to more investment spending, one component of aggregate spending. Furthermore, fiscal and monetary policy influence interest rates differently, and interest rates are the key determinant of the exchange rate. Expansionary fiscal policy is likely to raise interest rates and “crowd out” private investment while expansionary monetary policy, or reducing short-term interest rates, is likely to temporarily lower interest rates.

Intervening in foreign exchange markets directly is equivalent to changing monetary policy if the intervention is “unsterilized.” When a central bank sells foreign currency to boost the exchange rate, it takes the domestic currency it receives in exchange out of circulation, decreasing the money supply. Often, it prints new money to replace the domestic currency that has been removed from circulation — referred to as sterilization — but economic theory suggests that when it does so, it negates the intervention's effect on the exchange rate.⁴

If a government wishes to alter a floating exchange rate or maintain a fixed exchange rate, it may do so by altering fiscal and/or monetary policy *but only if it is*

¹ For example, see Robert Flood and Andrew Rose, “Fixing exchange rates: A Virtual Quest for Fundamentals,” *Journal of Monetary Economics*, v. 36, n. 1, December 1995, p. 1.

² For more information, see CRS Report RL30583, *The Economics of the Federal Budget Surplus*, by Brian Cashell.

³ For more information, see CRS Report RL30354, *Monetary Policy: Current Policy and Conditions*, by Gail Makinen.

⁴ Similarly, if exchange rate intervention was undertaken by a government's treasury, theory suggests it would have no lasting effect on the exchange rate because the treasury cannot alter the money supply.

willing to abandon other macroeconomic goals such as providing stable economic growth, preventing recessions, and maintaining a moderate, stable inflation rate. The magnitude of response of the exchange rate to changes in monetary or fiscal policy is not likely to be constant or predictable over time, but under most circumstances policy can eventually lead to the desired result if it is truly dedicated to achieving it. As discussed later, problems with exchange rates usually arise when a government's heart is not truly wedded to achieving its stated goal.

Floating Exchange Rates

The exchange rate arrangement maintained between the United States and all of its major trading partners is known as a floating exchange rate regime. In a floating exchange rate regime, the exchange rate is a price freely determined in the market by supply and demand. The dollar is purchased by foreigners in order to purchase goods or assets from the United States. Likewise, U.S. citizens sell dollars and buy foreign currencies when they wish to purchase goods or assets from foreign countries.⁵ The exchange rate is determined by whatever rate clears these markets. Monetary and fiscal policy are not regularly or systematically used to influence the exchange rate.⁶

Thus, when the demand for U.S. goods and/or assets rises relative to the rest of the world, the exchange rate value of the dollar will appreciate. This is necessary to restore balance or equilibrium between the dollar value exported and the dollar value imported. Dollar appreciation accomplishes this through two effects on the United States economy, all else being equal. First, it makes foreign goods cheaper for Americans, which increases the purchasing power of American income. This is known as the terms-of-trade effect. Second, it tends to offset the changes in aggregate demand that first altered the exchange rate. The offset in demand may not be instantaneous or complete, but it helps to make macroeconomic adjustment possible if wages and prices are not completely flexible.

When foreigners increase their demand for U.S. goods, aggregate demand in the United States increases. If the United States is in a recession, this increase in aggregate demand would boost growth in the short run. If economic growth in the United States is already robust, it would be inflationary — there would be too many buyers (domestic and foreign) seeking the goods that Americans can produce. Under a floating exchange rate, a substantial part of this increase in U.S. aggregate demand

⁵ The dollar is also widely used as an international medium of exchange for transactions that do not involve American goods or assets. These transactions have no effect on the exchange value of the dollar, however.

⁶ From time to time, governments and central banks in countries with floating exchange rates may enter the foreign exchange market in an attempt to influence the exchange rate value. This is known as “managed floating” or “dirty floating.” Historically, such interventions have had patchy success. When they have failed, it has frequently been due to the fact that intervention was not coupled with a change in monetary policy. Managed floating is very different from a fixed exchange rate regime, where monetary policy is devoted to maintaining the exchange rate value on a continual basis as its primary goal.

would be offset by the appreciation in the dollar, which would push U.S. exports and the production of U.S. import-competing goods back towards an equilibrium level. By reducing aggregate demand, an appreciating dollar reduces inflationary pressures that might otherwise result.

Likewise, if the foreign demand for U.S. assets increased, foreign capital would flow into the United States, lowering interest rates and increasing investment spending and interest-sensitive consumption spending (e.g., automobiles). Absent exchange rate adjustment, this would boost U.S. aggregate demand. But since the greater demand for U.S. assets causes the dollar to appreciate, the demand for U.S. exports and U.S. import-competing goods declines, offsetting the increase in demand caused by the foreign capital inflow.⁷

Since floating exchange rates allow for automatic adjustment, they buffer the domestic economy from external changes in international supply and demand. A floating exchange rate also becomes another automatic outlet for *internal* adjustment. If the economy is growing too rapidly, the exchange rate is likely to appreciate, which helps slow aggregate spending by slowing export growth. While this is unfortunate for exporters, overall it may be preferable to the alternative — higher inflation or a sharp contraction in fiscal or monetary policy to stamp out inflationary pressures. If the economy is in recession with falling income, the exchange rate is likely to depreciate, which will help boost overall growth through export growth even in the absence of domestic recovery.⁸

The maintenance of a floating exchange rate does not require support from monetary and fiscal policy. This frees the government to focus monetary and fiscal policy on stabilizing the economy in response to domestic changes in supply and demand. Fiscal and monetary policy usually can be focused on domestic goals, such as maintaining price and output stability, without being constrained by the policy's effect on the exchange rate.⁹ The drawback to fiscal and monetary autonomy, of course, is that governments are free to pursue ill-conceived policies if they desire, a particular problem for developing countries historically. Many times, a floating

⁷ This discussion assumes that changes in exchange rates are driven by changes in economic fundamentals. To the extent that they are, floating exchange rates are an equilibrating force. But if exchange rates are dominated by non-economic speculation — a proposal that economists have not been able to rule out empirically — then movements in floating exchange rates could be a destabilizing, rather than equilibrating, force. If this were true, it would weaken the primary argument in favor of floating exchange rates. To the extent that exchange rates may be driven by both non-economic speculation and economic fundamentals, a fixed exchange rate could be superior, but only if governments could promptly, correctly, and calmly adjust exchange rates when fundamentals changed.

⁸ Two seminal papers in favor of floating exchange rates are Milton Friedman, “The Case for Flexible Exchange Rates, in *Essays in Positive Economics*, The University of Chicago Press, (Chicago: 1953); and Harry Johnson, “The Case for Flexible Exchange Rates, 1969” in *Further Essays in Monetary Economics*, Harvard University Press, (Cambridge: 1973).

⁹ The Treasury is often asked to explain its “dollar policy.” The most accurate explanation would be that its policy is to use its macroeconomic tools to maintain domestic stability rather than exchange rate stability.

exchange rate is forced to act as an outlet for internal adjustment because poor fiscal and monetary policy have made adjustment necessary, causing stress on the trade sector of the economy. This can be thought of as a political, rather than an economic, drawback to floating exchange rates.

How valuable the macroeconomic adjustment mechanism that floating exchange rates provide depends on the economic independence of the country. For countries that are closely tied to others through trade and investment links, the ability to adjust policy independently has little value — whatever is affecting one economy is probably affecting its neighbors as well. For countries like the United States, whose economy is arguably more affected by internal factors than external factors, flexible exchange rates allow significant internal adjustment. Trade is still a relatively small portion of American GDP: exports are equivalent to about 10% of GDP, in comparison to a country like Malaysia or Singapore where exports exceed 100% of GDP.

The economic drawback to floating exchange rates is that exchange rate volatility and uncertainty may discourage the growth of trade and international investment. Uncertainty can be thought of as placing a cost on trade and investment, and this cost discourages trade. For example, after an international sale has been negotiated, one party to the transaction will not know what price he will ultimately receive in his currency because upon payment the exchange rate may be higher or lower than when he made the trade. If the exchange rate has depreciated, he will receive lower compensation than he had expected. The cost of this uncertainty can be measured precisely — it is the cost of hedging, that is the cost to the exporter of buying an exchange rate forward contract or futures contract to lock in a future exchange rate today.¹⁰ If trade and foreign investment are important sources of growth — especially for developing countries — as many believe it to be, floating exchange rates may impose a real cost not just to exporters and investors, but to society as a whole.

Hard Pegs and Soft Pegs

The alternative to floating exchange rates are exchange rate regimes that fix the value of the exchange rate to that of another country or countries. There are two broad types of fixed exchange rates. “Hard pegs,” currency boards and currency unions, are considered first because they are the most stark example of a fixed exchange rate arrangement. The second category considered is fixed exchange rates, in which the link to the other currency or currencies is less direct, making them “soft pegs.”

Currency Boards or Currency Unions

At the opposite end of the spectrum from floating exchange rates are arrangements where a country gives up its exchange rate and monetary freedom

¹⁰ The cost of hedging may be higher in countries with small, undeveloped financial markets, another reason why floating exchange rates may be less advantageous in small countries.

entirely by tying itself to a foreign country's currency, what former IMF Deputy Director Stanley Fischer calls "hard pegs." This can be done through a currency board or a currency union.¹¹ A currency board is a monetary arrangement where a country keeps its own currency, but the central bank cedes all of its power to alter interest rates, and monetary policy is tied to the policy of a foreign country.¹² For example, Hong Kong has a currency board linked to the U.S. dollar. Argentina had a similar arrangement which it abandoned in 2002, during its economic crisis. In Argentina, for every peso of currency in circulation the Argentine currency board held one dollar-denominated asset, and was forbidden from buying and selling domestic assets. Thus, the amount of pesos in circulation could only increase if there was a balance of payment surplus. In effect, the exchange rate at which Argentina competed with foreign goods is set by the United States. Since exchange rate adjustment was not possible, adjustment had to come through prices (i.e., inflation or deflation) instead. Domestically, since the central bank can no longer alter the money supply to change interest rates, the economy can only recover from peaks and valleys of the business cycle through price adjustment.

From an economic perspective, a currency union is very similar to a currency board. An example of a currency union is the euro, which has been adopted by 12 members of the European Union. The individual nations in the euro zone have no control over the money supply in their countries. Instead, it is determined by two factors. First, the European Central Bank (ECB) determines the money supply for the entire euro area by targeting short-term interest rates for the euro area as a whole. Second, how much of the euro area's money supply flows to, say, Ireland depends upon Ireland's net monetary transactions with the rest of the euro area. For this second reason, different countries in the euro area have different inflation rates despite the fact that they share a common monetary policy.

In a currency union such as the euro arrangement, each member of the euro has a vote in determining monetary policy for the overall euro area.¹³ This is the primary difference from a currency board — the country that has adopted a currency board has no say in the setting of monetary policy by the country to which its currency board is tied. The countries of the euro also share in the earnings of the ECB, known as seigniorage, just as they would if they had their own currency.

Not all currency unions give all members a say in the determination of monetary policy, however. For instance, when Ecuador, El Salvador, and Panama unilaterally

¹¹ For more information, see CRS Report RL31093, *A Currency Board As an Alternative to A Central Bank*, by Marc Labonte and Gail Makinen,.

¹² While perhaps theoretically feasible, it would be practically impossible to operate a timely or precise enough fiscal policy to maintain a currency board or fixed exchange rate as long as fiscal policy must be legislated. Thus, maintaining a fixed exchange rate has been delegated to the monetary authority in practice.

¹³ Specifically, each country is represented on the ECB's Governing Council, which determines monetary policy. The ECB has operational independence from the European Commission, EU Council of Ministers, and the national governments of the euro area, just as the Federal Reserve has operational independence from the U.S. Congress and executive branch.

adopted the U.S. dollar as their currency, they gained no influence over the actions and decisions of the Federal Reserve. From a macroeconomic perspective, a unilateral currency adoption and a currency board are indistinguishable. Between these two arrangements, there are only two minor differences of note. First, currency boards earn income on the dollar-denominated assets that they hold (another example of seigniorage) while currency adopters do not.¹⁴ Second, investors may view a currency union as a more permanent commitment than a currency board. If this were the case, they would view the risks associated with investment in the former to be lower.

Table 1. Differences in Types of Currency Arrangements

	Independent National Monetary Policy	Role in Setting Monetary Policy	Circulation of National Currency	Seigniorage Earnings
Currency Board	No	No	Yes	Yes
Joint Currency Union	No	Yes	No	Yes
Unilateral Currency Adoption	No	No	No	No

Economic Advantages to a Hard Peg. The primary economic advantage of a hard peg comes through greater trade with other members of the exchange rate arrangement. The volatility of floating exchange rates places a cost on the export and import-competing sectors of the economy. Greater trade is widely seen to be an engine of growth, particularly among developing countries. In a perfectly competitive world economy without transaction costs, the cost of exchange rate volatility could be very large indeed. For instance, since 1995 U.S. exporters and domestic firms that compete with importers would have faced one-third higher prices as a result of the (floating) dollar's one-third appreciation against its main trading partners. Until the domestic price level fell by one-third, U.S. producers would be uncompetitive, all else being equal. Under a system of fixed exchange rates, U.S. exporters would not have been placed at this price disadvantage, all else being equal. In reality, for reasons not entirely clear to economists, the prices of tradeable goods do not change as much or as quickly as the ideal would suggest, making the negative effect of a floating exchange rate on trade smaller than expected.¹⁵ Between small

¹⁴ There have been congressional proposals to transfer seigniorage earnings to countries that dollarize in order to encourage dollarization. For example, see H.R. 2617.

¹⁵ An overview of this extensive literature is given in Maurice Obstfeld, "International Macroeconomics: Beyond the Mundell-Fleming Model," National Bureau of Economic Research working paper 8369, pp. 12-18, July 2001.

countries, a hard peg is also thought to promote more efficient and competitive markets through lower barriers to entry and greater economies of scale.

Hard pegs also encourage international capital flows.¹⁶ The encouragement of international capital flows can enhance a country's welfare in a couple of ways. First, it allows more investment to take place in areas where saving is relatively scarce and rates of return are high, and investment is key to sustainable growth. This makes both the borrower and the investor better off; the former because more investment, and hence growth, is possible than otherwise would be, the latter because they can now enjoy higher rates of return on their investment for a given amount of risk than if limited to home investment. For developing countries, these investment gains can be quite large. Because these countries have much lower capital-labor ratios than the developed world, capital investment can yield relatively high returns for some time if a friendly economic environment is constructed. On the other hand, international capital flows can change rapidly in ways that can be destabilizing to developing countries, as will be discussed below.

Weighed against the gains of higher trade and international investment is the loss of the use of fiscal and monetary policy to stabilize the economy. For countries highly integrated with their exchange rate partners, this loss is small. For example, in the euro area, the business cycle of many of the "core" economies (e.g., Germany, Netherlands, Belgium) have been highly correlated. As long as Belgium does not face separate shocks from Germany, it does not lose any stabilization capabilities by giving up the ability to set policy independently of Germany. By sharing a currency, their fiscal and monetary policy can still be adjusted to respond jointly to shared shocks to their economies, even if these shocks are not shared by the rest of the world — the euro is free to adjust against the rest of the world's currencies. Troubles only arise if shocks harm one of these countries, but not its partners in the euro. In that case, there cannot be policy adjustment for that country to compensate for the shock.¹⁷

Political Advantages to a Currency Board or Union. The previous explanation described the economic reasons for establishing currency boards or currency unions. But it is probable that the primary reason for establishing them in developing countries is based more on political reasons. As has been shown, these

¹⁶ Hard pegs encourage foreign investment for slightly different reasons than they encourage trade. With trade, there is the danger under a floating exchange rate that a one-time appreciation will make your exporters uncompetitive until domestic prices adjust. Since the return on foreign investment is typically denominated in the foreign currency, a one-time exchange rate depreciation would lower the profitability of the investment held at the time of the depreciation. But it would have no effect on the profitability of new investment after the depreciation had ended.

¹⁷ Although fiscal policy can still be used as an adjustment mechanism in countries with hard pegs, there are constraints on its effectiveness in most of these countries. In the euro area, countries are legally forbidden from running fiscal deficits greater than 3% of GDP (although that rule has recently been flouted). In developing countries, fiscal policy is constrained by the willingness of investors to purchase their sovereign debt, and investors have proven much less willing to finance developing country deficits than deficits in the developed world.

monetary arrangements tie the hands of their country's policymakers. For some countries, this is precisely what their policymakers are trying to achieve — a way to prevent the reinstatement of policies from the “bad old days.” The most stark example of the “bad old days” is the hyperinflation that many developing countries experienced. For instance, in 1990, the year before Argentina adopted a currency board, its inflation rate reached 2,314%. Stable growth is impossible when the price mechanism has broken down in this way. The currency board quickly brought the inflation rate in Argentina down to single digits. Whenever a country's inflation rate gets extremely high, it is a reflection of its fiscal policy. Large budget deficits cannot be financed through the sale of debt instruments, so they are instead financed through the printing of money. Thus, a currency board prevents irresponsible fiscal policy by preventing monetary policy from supporting it.

Similarly, Ecuador “dollarized” in 2000 — adopting the U.S. dollar and largely discontinuing the use of its own currency — at a time of economic crisis with the hope that it would renew investor confidence. While extremely high inflation had not yet become a problem, events leading up to dollarization appeared to be pointing in that direction. The country's banking system had collapsed, its economy had shrunk by over 7% in 1999, low oil prices and natural disaster had caused budget financing problems, and it had defaulted on some of its sovereign debt. Investors had become very concerned that inflationary monetary policy would be used to solve its fiscal problems, and dollarization quelled these fears by eliminating that policy option.

Economic analysis sheds little light on the choice between floating exchange rates and a currency board arrangement when the decision is motivated by the desire to find a political arrangement that will prevent the pursuit of bad policies. Economic analysis can identify bad policy; it cannot explain why it is pursued or how to prevent its recurrence. A currency board is not the only way to tie the hands of policymakers; various rules and targets have been devised to eliminate policy discretion that could be used with a floating exchange rate. A currency board may be a more final commitment, and hence harder to renege on, than rules and targets, however. Then again, Argentina proved that even currency boards are not permanent. In any case, the political problem of countries monetizing budget deficits seems to be waning. In the late 1990s, the median annual inflation rate in developing countries fell to 5%. If current trends continue, in the future there may be fewer countries who find it advantageous to accept the harsh medicine of hard pegs to solve their political shortcomings.¹⁸

Hard pegs are also seen by both proponents and opponents as a means to foster political integration, a topic beyond the scope of this report. This was a primary consideration behind the adoption of the euro.

¹⁸ Michael Mussa *et al.*, “Exchange Rates in an Increasingly Integrated World Economy,” *IMF Occasional Paper 193*, 2000, p. 17.

Fixed Exchange Rates

In a traditional fixed exchange rate regime, the government has agreed to buy or sell any amount of currency at a predetermined rate. That rate may be linked to one foreign currency or (unlike a currency board) it may be linked to a basket of foreign currencies. In theoretical models, where capital is perfectly mobile and investors consider all countries to be alike, fixed exchange rates would necessarily be functionally equivalent to a currency board. Any attempt to unilaterally influence one's interest rates, through monetary or fiscal policy, would be unsustainable because capital would flow in or out of the country until interest rates had returned to the worldwide level.

In reality, results are not quite so stark. There are transaction costs to investment. Investors demand different risk premiums of different countries, and these risk premiums change over time. There is a strong bias among investors worldwide, particularly in developed countries, to keep more of one's wealth invested domestically than economic theory would suggest.¹⁹ Due to these factors, interest rate differentials, which should be theoretically impossible, are abundant. For instance, interest rates in France and Germany should entail similar risks. Thus, anytime French interest rates exceeded German rates, capital should flow from Germany to France until the rates equalized again. Yet the commercial interest reference rate, as measured by the OECD, between these two countries has varied by as much as 1.61 percentage points between 1993 and the adoption of the euro in 1999.

As a result, countries with fixed exchange rates have limited freedom to use monetary and fiscal policy to pursue domestic goals without causing their exchange rate to become unsustainable. This is not true for countries that operate currency boards or participate in currency unions. For this reason, these regimes can be thought of as "soft pegs," in contrast to the "hard peg" offered by a currency board or union. But compared to a country with a floating exchange rate, the ability of a country with a fixed exchange rate to pursue domestic goals is highly limited. If a currency became overvalued relative to the country to which it was pegged, then capital would flow out of the country, and the central bank would lose reserves. When reserves are exhausted and the central bank can no longer meet the demand for foreign currency, devaluation ensues, if it has not already occurred before events reach this point.²⁰ The typical reason for a fixed exchange rate to be abandoned in crisis is due to an unwillingness by the government to abandon domestic goals in favor of defending the exchange rate. Interest rates can almost always be increased

¹⁹ If individuals saw all countries as being equal, to achieve portfolio diversification the average American investor would hold only about 1/4 of his wealth in American assets and about 3/4 in foreign assets because the U.S. economy accounts for that fraction of the world economy. Likewise, foreigners would hold 1/4 of their wealth in American assets and 3/4 abroad. In reality, Americans hold only about 1/10 of their wealth in foreign assets.

²⁰ The problem is asymmetric. If a fixed exchange rate became undervalued, then capital would flow into the country and the central bank would accumulate reserves. As long as the central bank is willing to increase its foreign reserves, an undervalued exchange rate can be sustained. This is believed to be the case with China from 2002-2003.

to a point where capital no longer flows out of the country, but great domestic contraction may accompany those rate increases. It is not uncommon to see interest rates reach triple digits at the height of an exchange rate crisis. Crises ensue because investors do not believe that the government will have the political will to accept the economic hardship required to maintain those interest rates in defense of the currency.

Economic Advantages of a Fixed Exchange Rate. As with a hard peg, a fixed exchange rate has the advantage of promoting international trade and investment by eliminating exchange rate risk. Because the arrangement may be viewed by market participants as less permanent than a currency board, however, it may generate less trade and investment.

As with a hard peg, the drawback of a fixed exchange rate is that it gives the government less scope to use monetary and fiscal policy to promote domestic economic stability. Thus, it leaves countries exposed to idiosyncratic shocks not shared by the country to which it has fixed its currency. As explained above, this is less of a problem than with a hard peg because imperfect capital mobility does allow for some deviation from the policy of the country or countries to which you are linked. But the shock would need to be temporary in nature because a significant deviation could not last.

The scope for the pursuit of domestic goals is greater for countries that fix their exchange rate to a basket of currencies — unlike a hard peg, the country is no longer placed at the mercy of the unique and idiosyncratic policies and shocks of any one foreign country. One method for creating a currency basket is to compose it of the currencies of the country's primary trading partners, particularly if the partner has a hard currency, with shares set in proportion to each country's proportion of trade. If the correlation of the business cycle with each trading partner is proportional to the share of trade with that country, then the potential for idiosyncratic shocks to harm the economy should be considerably reduced when pegged to a basket of currencies. On the down side, baskets do not encourage as much bilateral trade and investment as a peg to a single currency because they reintroduce bilateral exchange rate risk with each trading partner.

Political Advantages of a Fixed Exchange Rate. In previous decades, it was believed that developing countries with a profligate past could bolster a new commitment to macroeconomic credibility through the use of a fixed exchange rate for two reasons. First, for countries with inflation rates that were previously very high, the maintenance of fixed exchange rates would act as a signal to market participants that inflation was now under control. For example, inflation causes the number of dollars that can be bought with a peso to decline just as it causes the number of apples that can be bought with a peso to decline. Thus, a fixed exchange rate can only be maintained if large inflation differentials are eliminated. Second, a fixed exchange rate was thought to anchor inflationary expectations by providing stable import prices. For a given change in monetary policy, it is thought that inflation will decline faster if people expect lower inflation.

After the many crises involving fixed exchange rate regimes in the 1980s and 1990s, this argument has become less persuasive. Unlike a currency board, a fixed

exchange rate regime does nothing concrete to tie policymakers' hands and prevent a return to bad macroeconomic policy. Resisting the temptation to finance budget deficits through inflation ultimately depends on political will; if the political will is lacking, then the exchange rate regime will be abandoned, as was the case in many 1980s exchange rate crises. Thus burnt in the past, investors may no longer see a fixed exchange rate as a credible commitment by the government to macroeconomic stability, reducing the benefits of the fixed exchange rate.²¹ Furthermore, some currency board proponents claim that this lack of credibility means that investors will "test" the government's commitment to maintaining a soft peg in ways that are costly to the economy. By contrast, they claim that investors will not test a currency board because they have no doubt of the government's commitment.

For this reason, many economists who previously recommended fixed exchange rates on the basis of their political merits have shifted in recent years towards support of a hard peg. This has been dubbed the "bipolar view" of exchange rate regimes: growing international capital mobility has made the world economy behave more similarly to what models have suggested. As capital flows become more responsive to interest rate differentials, the ability of "soft peg" fixed exchange rate regimes to simultaneously pursue domestic policy goals and maintain the exchange rate has become untenable. As a result, countries are being pushed toward floating exchange rates (the pursuit of domestic goals) or "hard pegs" (policy directed solely toward maintaining the exchange rate). In this view, while "soft pegs" may have been successful in the past, any attempt by a country open to international capital to maintain a soft peg today is likely to end in an exchange rate crisis, as happened to Mexico, the countries of Southeast Asia, Brazil, and Turkey. Empirically, the trend does appear to be moving in this direction. In 1991, 65% of the world's 55 largest economies used "soft peg" exchange rate arrangements; in 1999, the number had fallen to 27%.²²

Although the international trend has been towards greater capital mobility and openness, it should be pointed out that there are still developing countries that are not open to capital flows. The "bipolar view" argument may not hold for these countries: without capital flows reacting to changes in interest rates, these countries may be capable of maintaining a soft peg and an independent monetary policy. This has been the case for China.

What Have Recent Crises Taught Us About Exchange Rates?

The previous discussion summarizes the textbook advantages and disadvantages of different exchange rate regimes. As such, it abstracts and simplifies from many

²¹ In this light, soft pegs based on a basket of currencies are typically viewed as a less transparent arrangement involving less political commitment to maintaining discipline than a soft peg based on a single currency.

²² Stanley Fischer, "Exchange Rate Regimes: Is the Bipolar View Correct?" *Journal of Economic Perspectives*, v. 15, n. 2, Spring 2001, p. 9.

economic issues that may bear directly on real policymaking. In particular, it neglects the possibility that crisis could be caused or transmitted through international goods or capital markets, and the transmission role exchange rates can play in crisis. The remainder of the report will be devoted to trying to glean some general lessons from the international crises of the 1990s to enrich our understanding of how different exchange rate regimes function. The primary lesson seems to be that fixed exchange rate regimes are prone to crisis, while crisis is extremely improbable under floating regimes. Unlike the crises of the 1980s, most of the countries involved in 1990s crises — particularly Southeast Asia — had relatively good macroeconomic policies in place (e.g., low inflation, balanced budgets, relatively free capital mobility). Thus, crises cannot be blamed simply on policy errors.

Fixed exchange rate regimes are prone to crisis because investors are compelled to remove their money from a country before it devalues. It is similar to a fire in a crowded

The primary lesson of the 1990s seems to be that fixed exchange rate regimes are prone to crisis, while crisis is extremely improbable under floating regimes.

theater: although everyone entered the theater in an orderly fashion, if everyone tries to rush out at once, the doors jam and the fire becomes a catastrophe. Proponents of fixed exchange rate regimes often argue that they can be adjusted if they “get out of line.” But the weakness of fixed exchange rate regimes is that when economic fundamentals change in such a way that devaluation becomes necessary, there is no mechanism to devalue except crisis. Even if a government wanted to announce a planned devaluation to avoid crisis, the announcement would likely spur anticipatory capital flight as investors tried to withdraw their investments before the new exchange rate was implemented.

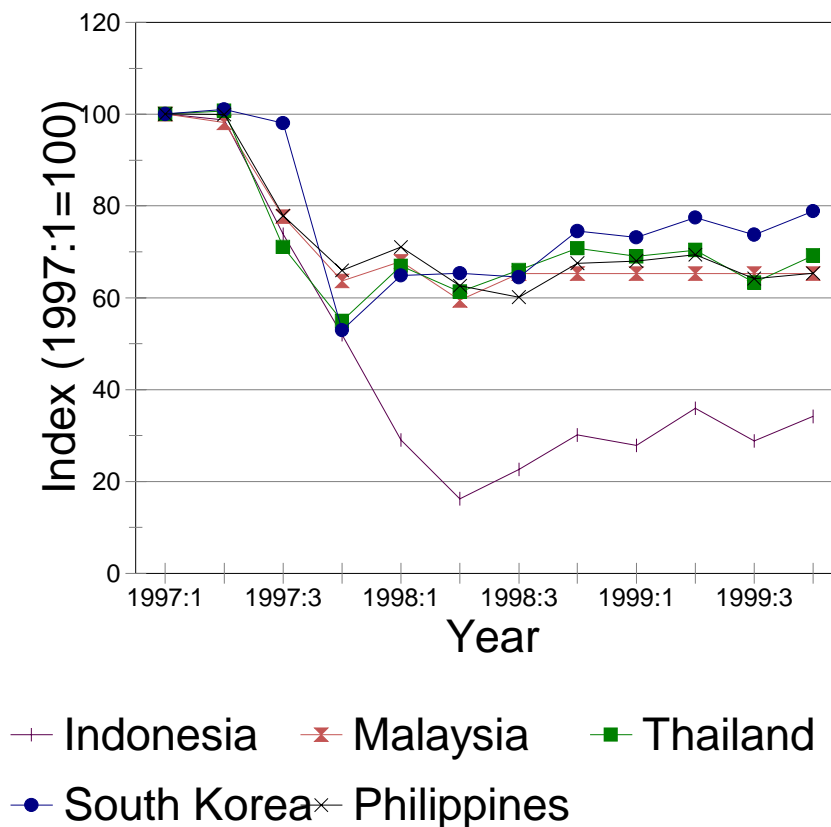
Corruption, “crony capitalism,” and “greedy speculation” are not needed to explain why fixed exchange rates collapse. The countries forced to devalue during the Asian Crisis (Thailand, Malaysia, Philippines, Indonesia, and South Korea) had very different economic structures and political systems, and were at different stages of economic development, ranging from a per capita GDP of \$15,355 in South Korea to \$4,111 in Indonesia.²³ What they all had in common was their exchange rate peg to the U.S. dollar. The Asian crisis was instigated by the fact that the appreciating U.S. dollar, to which the crisis countries were fixed, had made their exports less competitive and encouraged imports, particularly compared to China (which had devalued its exchange rate in 1994) and Japan.

Investment bubbles, notably in property markets, seemed to be present in all of the crisis countries, although there is no accepted method to identify them even after the fact. Some argue that the bursting of these bubbles played a key role in instigating the crises. Theories for why the bubbles formed include widespread state allocation of capital, poor local financial regulation, and simple misguided exuberance on the part of investors. Whether the bursting of such a bubble could have instigated the crisis under a floating exchange rate is debatable. Some sharp

²³ At purchasing power parity in 1997, before the crisis. Source: DRI-WEFA.

declines in asset prices have sparked serious crises and downturns, as was the case in Japan in the early 1990s. Other times, sharp price declines have not caused crisis and have had little lasting effect on the economy, as was the case with the United States in 1987. But what is clear is that an asset bubble and a fixed exchange rate can interact in ways more virulent than their individual parts. To the extent that asset prices would have fallen in Asia to return to their fundamental levels anyway, the presence of a fixed exchange rate ensured that it would happen suddenly because of the “fire in a theater” principle. To the extent that a devaluation would have been necessary anyway, the presence of an asset bubble assured that the outflows would be larger, placing more of a strain on the countries’ financial systems.

Figure 1. Exchange Rates of Asian Crisis Countries



Source: International Monetary Fund, *International Financial Statistics*, (Washington: March 2000)

Note: Exchange rates are the market bilateral dollar exchange rate measured at the end of the quarter.

When investors recognize a situation where devaluation becomes likely, even though they may have had no intention of leaving a country otherwise, they have every incentive to remove their money before the devaluation occurs because devaluation makes the local investment worth less in foreign currency. Since the central bank’s reserves will always be smaller than liquid investment when capital

is mobile, devaluation becomes inevitable when investors lose faith in the government's willingness to correct the exchange rate's misalignment. To an extent, the phenomenon then takes on the aspect of a self-fulfilling prophecy. The reason the depreciation of a currency in crisis is typically so dramatic is because at that point investors are no longer leaving because of economic fundamentals, but simply to avoid being the one "standing when the music stops."

Notice that in the textbook explanation, a currency depreciation is expected to boost growth through an improved trade balance. In a currency crisis, this does not happen at first, although it does happen eventually, because resources cannot be reallocated towards increased exports quickly enough to compensate for the blow to the economy that comes through the sudden withdrawal of capital. In the Asian crisis, businessmen told of export orders they were unable to fill following devaluation because their credit line had been withdrawn.

The shock of the capital outflow is exacerbated by the tendency for banking systems to become unbalanced in fixed exchange rate regimes. When foreigners lending to the banking system start to doubt the sustainability of an exchange rate regime, they tend to shift exchange rate risk from themselves to the banking system in two ways. First, foreign investors denominate their lending in their own currency, so that the financial loss caused by devaluation is borne by the banking system. Before devaluation, a bank's assets might exceed its liabilities. With devaluation, the foreign currency liabilities suddenly multiply in value with the stroke of a pen without any physical change in the economy, and the banks become insolvent.²⁴ Second, foreign lending to the banking system is done on a short-term basis so that investments can be repatriated before devaluation takes place. This is problematic because most of a bank's investments are longer term. The banks then enter a cycle where the short term debt is rolled over until crisis strikes, at which point credit lines are cut. Both of these factors lead to a situation where a currency crisis causes a banking crisis, which is a much more significant barrier to economic recovery than the devaluation itself. These two characteristics both tend to be present when lending to developing countries even in good times; the tendencies are accelerated when booms look unsustainable. An exception may have been Brazil, which some economists have suggested recovered so quickly from its devaluation because its banking system had few short-term, foreign currency denominated assets.²⁵

It is not necessarily illogical for the banking system to take on loans on a short term basis or denominated in foreign currency when credit conditions tighten. If it did not accept all forms of financing available to it, it could face insolvency at worst and a significant contraction in business at best. If the banks believe that the downturn is temporary and the episode will pass without a currency devaluation, then the banks will be able to repay the loans once conditions improve. If devaluation

²⁴ The insolvency problem occurs because, in practice, the bank does not denominate its assets in terms of the foreign currency. This is presumably because its assets are domestic loans.

²⁵ Paul Krugman, "Crises: The Price of Globalization?" paper presented at Federal Reserve Bank of Kansas City symposium, August 2000.

causes them to fail, they may expect the government to bail them out, perhaps explaining their willingness to accept these currency risks.

These factors make it clear that once a country enters a currency crisis, there is no policy response that can avoid significant economic dislocation. A policy to lower interest rates to boost aggregate demand and add liquidity to the financial system causes the currency to devalue further, increasing the capital outflow and exacerbating the banking system's insolvency. A policy to raise interest rates in support of the currency exacerbates the economic downturn brought on by crisis by reducing investment demand further. This too can feed through to the banking system and capital markets by bankrupting significant portions of the private sector. And it may not quell the currency crisis. In a textbook analysis, interest rates can always be increased to attract back the capital leaving. In reality, after a certain point higher interest rates increase default risk, perhaps causing more capital flight than lower interest rates would bring.²⁶

Once a country enters a currency crisis, there is no policy response that can avoid significant economic dislocation.

Both the Mexican crisis and the East Asian crisis were exacerbated by contagion effects where crisis spread from country to country in the region. This cannot be explained by an irrational (and degrading) assumption by investors that “all Asians/South Americans are crooks.” Rather, it reflects the regional interdependence of these economies. Although there is no *a priori* evidence that South Korea's currency was overvalued, it became overvalued once its neighbors were forced to devalue. That is because its exports competed with its neighbors, and exports accounted for a large fraction of its GDP. After its neighbors devalued, South Korean exporters — already struggling because the Japanese yen had been depreciating — could no longer offer competitive prices. Simultaneously, it appears that investors' perception of the riskiness of emerging markets in general greatly increased, curtailing lending to South Korea, which placed pressure on interest rates and investment.²⁷ At this point, the deterioration in economic fundamentals caused the Korean won to become overvalued, and currency crisis spread.

One may ask why the Bretton Woods fixed exchange rate system that fixed the currencies of the major western economies from 1945-1971 was not prone to crisis (at least before it collapsed). The reason is that capital mobility was largely curtailed under the Bretton Woods system.²⁸ Without capital mobility, central banks could use

²⁶ Jason Furman and Joseph Stiglitz, “Economic Crises: Evidence and Insights from East Asia,” *Brookings Papers on Economic Activity* 2, Brookings Institution, (Washington: 1998), p. 1.

²⁷ Foreign portfolio investment in Korea fell from an inflow of \$12,287 million in 1996 to an outflow of \$2,086 million in the fourth quarter of 1997, while foreign lending to banks fell from an inflow of \$9,952 million in 1996 to an outflow of \$6,125 million in the fourth quarter of 1997.

²⁸ “Most countries in Europe did not restore (currency) convertibility until the end of 1958, (continued...) ”

their reserves to accommodate small changes in fundamentals and could respond to large changes in fundamentals with a (relatively) orderly devaluation. As long as capital remains mobile — and almost nobody has supported a return to permanent capital controls — the Bretton Woods arrangement cannot be replicated. It was not long after capital controls were removed that the Bretton Woods system experienced a growing number of currency crises in the 1960s and 1970s, leading to its eventual demise.

Some economists argue that if short-term, foreign-currency denominated debt is the real culprit in recent crises, then it makes more sense to address the problem directly, rather than through the indirect approach of making it more costly through a floating exchange rate. The problem could be addressed directly through various forms of capital controls, financial regulations, or taxes on capital flows. They argue that capital controls are necessary until financial markets become well enough developed to cope with sudden capital inflows and outflows. Capital controls would also allow countries to operate an independent monetary policy while maintaining the trade-related benefits of a fixed exchange rate, similar to how the Bretton Woods system operated. Yet capital controls deter capital inflows as well as capital outflows, and rapid development is difficult without capital inflows. Capital controls may make crises less likely, but they are also likely to reduce a country's long run sustainable growth rate.

That is not to argue that floating exchange rates are stable and predictable, as some economists claimed they would be before their adoption in the 1970s. Rather, it is to argue that their volatility has very little effect on the macroeconomy. For example, the South African rand lost half of its value against the U.S. dollar between 1999 and 2001. Yet GDP growth averaged 2.8% and inflation averaged 5.4% in those years. To be sure, when exchange rates change their value by a significant amount in a few years, exporting and import-competing sectors of the economy suffer. Manufacturing and farming are among those sectors in the United States. But there is very little evidence to suggest that in a well-balanced economy such as the United States, other sectors of the economy cannot pick up the slack when the currency appreciates, especially when monetary policy is applied prudently. The one-third appreciation of the dollar and record trade deficits between 1995-2000 did not prevent the U.S. economy from achieving stellar growth and unemployment that at one point dipped below 4%. While floating exchange rates sometimes move by substantial amounts in a couple of years, they do not move by substantial amounts overnight, as happens in fixed exchange rate crises. And that is the key reason why floating exchange rates are not prone to financial and economic crises.

Floating and fixed exchange rates both impose costs on economies. Floating exchange rates impose a cost by discouraging trade and investment. Fixed exchange rates impose a cost by limiting policymakers' ability to pursue domestic stabilization. But there is a fundamental difference in the types of costs they impose. In most

²⁸ (...continued)

with Japan following in 1964.... The restoration of convertibility did not result in immediate and complete international financial integration..." Paul Krugman and Maurice Obstfeld, *International Economics*, Addison-Wesley, (Reading, MA: 1997), p. 551.

countries, the cost of floating exchange rates is internalized and can be managed through the market in the form of hedging.²⁹ (Developing countries with undeveloped financial systems may not be able to adequately hedge exchange rate risk, however.) Part of the cost of fixed exchange rates is an externality and cannot be hedged away. In other words, society as a whole bears some of the costs of fixed exchange rate regimes, so that market participants do not take that cost into account in their transactions. The costs that society bears are threefold. First, to the extent that a country faces unique shocks to its economy, it gives up the ability to protect its economy against these shocks. Those involved in international trade and investment do not compensate society at large for the fact that the volatility of aggregate unemployment and inflation has been increased. Second, the fixed exchange rate regime is more prone to crisis, which further increases the probability of high unemployment episodes. Even if floating exchange rates were to lead to lower growth because they dampen the growth of trade and foreign investment, risk averse individuals may prefer that outcome if it leads to fewer crises. Third, in some historical instances, fixed exchange rates have weakened the banking system through their incentives to take on debt that cannot be repaid in the event of devaluation. Of the three factors, the last is the only one that could theoretically be rectified through regulation, although implementing such regulation in practice could be difficult.

This is not to argue that fixed exchange rate regimes are never superior to floating regimes. The United States would not be better off with 50 separate currencies for each state even though it would ameliorate regional recessions. When countries economies are interdependent enough, the benefits of fixed exchange rates outweigh the costs: regions experience fewer unique shocks, labor mobility improves, product markets may benefit from greater competition and economies of scale, and capital market integration increases. But few countries meet this criterion. Whether the countries of the euro zone become interdependent enough to make the euro sustainable remains to be seen. At the time the euro was introduced, growth between the “core” (countries like Germany and Italy) and the “periphery” (countries like Ireland and Finland) were widely divergent, although they seem to have narrowed since the euro was introduced.

But many developing countries that have adopted (or have considered adopting) fixed exchange rates are not well integrated with the economy to which they are linked (see appendix). That is because these countries are looking to link to the world’s major “hard” currencies, the U.S. dollar, the euro, the Japanese yen, the British pound, or the Swiss franc. Since they are often choosing to fix their exchange rate to gain credibility (e.g., after an episode of high inflation), only a hard currency would provide that credibility. But since the economies of most developing countries are not closely tied to these hard currency economies, they are likely to face very different economic shocks that require adjustment that would not be provided through the policies of the hard currency countries to which they are tied. This makes these countries more prone to boom and bust than they would be with a (responsibly run) floating exchange rate. Certainly, Russia and the countries of East

²⁹ If floating exchange rates do fluctuate irrationally as some economists have posited, this imposes another cost on an economy, a cost that can be eliminated with no sacrifice by a fixed exchange rate.

Asia and Latin America that were struck by currency crises in the 1990s were not closely enough integrated with the U.S. economy to make a dollar peg sustainable. Of these countries, only Mexico and the Philippines experienced growth that was positively correlated with U.S. growth in the 1990s.

Proponents of currency boards argue that they do not suffer the vulnerabilities of traditional fixed exchange rates because devaluation becomes too costly an option for the government to consider. For that reason, they argue, investors have no qualms about the safety of their money, and speculators know they cannot undermine the currency so they do not try. The example of Argentina's currency board demonstrates why this argument is unpersuasive.³⁰ In making this argument, currency board proponents are only focusing on the political advantage to a currency board — it makes profligate fiscal and monetary policy impossible. But this is not the only factor that makes economies grow and investors choose them as an investment location. A currency board eliminates currency risk, but it does nothing to eliminate a country's macroeconomic risk, to which investors are just as sensitive. For example, there are good reasons why the overall U.S. economy would not be significantly affected by the dollar's one-third appreciation since 1995, but there is no reason why the Argentine economy would be unaffected. It had not received the large capital inflows or experienced the rapid economic growth that made the dollar's appreciation sustainable — some would argue, desirable — for the United States despite its implication for exporters. Thus, Argentine's exporters and import-competing industries became uncompetitive in the last 5 years with no countervailing factors to make other sectors of the economy competitive. In fact, developments to the Argentine economy suggest a floating exchange rate would have naturally *depreciated* in recent years to offset negative factors. The prices of commodities (which are important exports for Argentina) had been falling, foreign investment to developing nations had fallen since the Asian crisis, and Argentina's largest trading partner, Brazil, underwent a significant devaluation in 1998. Although the currency board may have lowered political risk in Argentina, for these reasons, it greatly increased macroeconomic risk, and that is why the currency board collapsed in 2002. In the face of macroeconomic risk and political upheaval, Argentina proved that no currency arrangement is permanent.

It is beyond the scope of this report to explore the question of whether developing countries with a profligate economic past can make a credible new start without fixing their exchange rates. Some economists go farther and suggest that in today's globalized economy, fixed exchange rates are no longer viable, and adopting a foreign currency becomes necessary for a country trying to make a new start. In those few cases where a natural currency union partner already exists, a fixed exchange rate offers considerable economic advantages, particularly for a country trying to overcome a profligate past. For all other countries, after considering the experience of recent years, the economic advantages to floating exchange rates seem considerable.

³⁰ For more information on the Argentine economy, see CRS Report RL31169, *Argentina: Economic Problems and Solutions*, by Gail Makinen.

Appendix: How Interdependent Are International Economies?

The statement that some international economies are naturally suited for floating exchange rate regimes while some economies are naturally suited for a fixed exchange rate with a major trading partner is an uncontroversial statement among economists. It is based on the insights first provided by Robert Mundell's model of an optimum currency area, which outlines the criteria that determine under what circumstances a fixed exchange rate would succeed.³¹ This model underlines the discussion of advantages and disadvantages presented in the first part of this report. Controversy arises among economists on two points. First, it arises on the political question of how important the political benefits of fixed exchange rates should be, which cannot be addressed by the model. Second, it arises from the fact that the empirical parameters of the optimum currency area model are not well established, with economists disagreeing about how much integration is actually needed for a fixed exchange rate to succeed.

This appendix attempts to offer some empirical evidence on the latter question. It approximates a country's interdependence with its largest trading partner based on two key criteria from the optimum currency area model:

- How closely linked the two countries are through trade, measured as exports to the trading partner as a percentage of GDP in 1999.
- The degree of correlation between the two countries' business cycles, measured as correlation of economic growth from 1990-1999.³²

The results are presented for selected developed countries and areas in **Table 2** and for selected developing countries in **Table 3**.

³¹ Robert Mundell, "A Theory of Optimum Currency Areas," *American Economic Review*, v. 51, September 1961, pp. 657-665.

³² Correlation is a measure of the typical relationship in the movement of two variables. It is measured such that correlation equals -1 when the variables move in exactly opposite direction, equals 0 when there is no relationship in the movement of the two variables, and equals 1 when the variables move in exactly the same direction.

Table 2. Economic Interdependence of Selected Developed Countries and Hong Kong

Country	Largest Trading Partner	Exports to Largest Partner (as % GDP)	Correlation of Growth with Largest Partner
Australia	Japan	3.6%	-.54
Canada	U.S.	37.9%	.90
Denmark	euro area	16.6%	.36
Hong Kong	China	60.1%	.47
New Zealand	Australia	6.7%	.60
Norway	euro area	18.4%	-.12
Singapore	U.S.	25.9%	-.19
Sweden	euro area	18.1%	.57
Switzerland	euro area	22.6%	.68
United Kingdom	euro area	12.9%	-.12

Source: International Monetary Fund, *International Financial Statistics*

Note: Data are for 1999 except ; correlation is between 1990-1999; All countries in the table maintain a floating exchange rate regime except for Hong Kong, which operates a currency board, and Denmark, which operates a fixed exchange rate.

Using any specific cutoff point to define two economies as interdependent vs. independent for either measure would be arbitrary, but one can see that many countries do not achieve even the bare minimum of interdependence. Negative growth correlation means that, overall, the business cycle in the largest trading partner was typically moving in the opposite direction of the country for any given year in the 1990s. Typically, this would put pressure on their exchange rates to move in opposite directions as well. The disclaimer that past relationships do not imply future causation is always needed in macroeconomics. Still, there is not much reason for hope that two countries with negative correlation in the past would be sufficiently positively correlated in the future to form a successful fixed exchange rate regime. Similarly, it would be difficult to argue that the largest trading partner had a significant effect on the country if the country's exports were not equivalent to even, say, 10% of the country's GDP.

By these measures, of the countries in **Table 2**, Australia, Norway, and the United Kingdom seemed poorly suited for a fixed exchange rate in the 1990s. To an extent, these results reflect common sense observation, as all three countries experienced shocks that were idiosyncratic from their major trading partner — Norway's economy is heavily (positively) influenced by oil prices; the major British economic crisis of the 1990s was the devaluation of the pound, caused by the disparity between its economic conditions and conditions in Western Europe; and

Australia is relatively physically isolated and not overly reliant on any particular trading partner. A case could be made for a fixed exchange rate for the other countries in the table; a strong case could be made for Canada, Sweden, Switzerland, and Hong Kong (to China).

But a closer look at Canada suggests that a successful floating exchange rate may not be incompatible even with a country as closely interdependent with its neighbor as Canada is with the United States. Despite its interdependence, the Canadian dollar experienced significant depreciation from 1991-1999, yet the Canadian economy showed no obvious adverse effects. Between 1991 and 1999, the Canadian dollar depreciated by 22% against the U.S. dollar in nominal terms. There were 4 years when the currency depreciated by more than 5% in a single year. Yet Canadian growth was strong from 1994 onwards, with the exception of 1996, and its inflation rate was lower than the United States in all but 3 years from 1990-1999.³³

Table 3 suggests many countries operate the opposite exchange rate regime from what the optimum currency model would suggest — despite the fact that the implementation of a particular exchange rate regime would be expected to create economic conditions more amenable to the regime. Among developing countries, a case could be made for a fixed exchange rate in the 1990s in Bulgaria, Hungary, the Philippines, and Poland; of which the latter two actually operated a floating exchange rate. A floating exchange rate seems more suitable in Ecuador, Saudi Arabia, Brazil, Chile, Colombia, Pakistan, South Africa, and South Korea; of which the first two operated fixed exchange rates. The remaining cases are more ambiguous.

One could object to the fact that growth correlation in the 1990s is artificially low as a predictor of future growth because many developing countries underwent economic crises in the 1990s that will be unlikely to be repeated in the future. In particular, many of the countries listed in the table as maintaining a floating exchange rate maintained a fixed exchange rate until crisis forced them to abandon their peg. Countries to abandon their fixed exchange rate in crisis since the 1990s include Mexico, Thailand, South Korea, Indonesia, the Philippines, Russia, the Czech Republic, and Brazil. (Argentina and Turkey abandoned their currency pegs after 1999, the period covered in the table.³⁴) This is a valid argument, but on the other hand, one could argue that the countries arguably underwent these crises because their economies experience very different shocks than the United States, to whom they had all fixed their exchange rate. There is no obvious reason to think that these idiosyncracies will disappear in the future.

³³ Inflation is measured by the price deflator, as recorded by the IMF. The lower Canadian inflation rate signifies that the real bilateral exchange rate depreciation was greater than the nominal depreciation. In 3 of the 4 years when the currency depreciated by more than 5%, Canadian inflation was lower than U.S. inflation.

³⁴ Before the currency crisis, the Czech Republic fixed its exchange rate to a dollar-deutschmark basket. Also, Malaysia and Hong Kong both experienced significant economic dislocation during the Asian crisis, but Hong Kong maintained its currency board and Malaysia maintained its peg after a devaluation.

Perhaps the most surprising result of the analysis was the number of countries whose largest trading partner was not the country to which they have or previously had fixed their exchange rate. According to the optimum currency area model, Argentina should have fixed its exchange rate to Brazil instead of the United States, Hong Kong should have fixed to China instead of the United States,³⁵ Indonesia should have fixed to Japan instead of the United States, Russia should have fixed to the euro instead of the United States, and Brazil should have fixed to the euro instead of the United States. This observation underlines the fact that exchange rate regimes are often pursued as much for political reasons as economic reasons, and the economic risks that political decision entails.

³⁵ The Hong Kong problem is in fact solved since China also maintains a fixed exchange rate with the United States.

Table 3. Economic Interdependence of Selected Developing Countries

	Country	Largest Trading Partner	Exports to Largest Partner (as % GDP)	Correlation of Growth with Largest Partner
Hard Peg	Argentina	Brazil	2.4%	.07
	Bulgaria	euro area	24.2%	.30
	Ecuador	U.S.	9.5%	-.43
Fixed Exchange Rate	China	U.S.	4.2%	.09
	Egypt	euro area	5.2%	.39
	Hungary	euro area	37.3%	.64
	Malaysia	U.S.	26.7%	-.41
	Morocco	euro area	14.3%	.16
	Saudi Arabia	U.S.	6.7%	-.70
	Turkey	euro area	11.3%	-.21
Floating Exchange Rate	Brazil	euro area	1.8%	-.41
	Chile	U.S.	5.6%	-.29
	Colombia	U.S.	9.2%	-.20
	Czech Republic	euro area	40.7%	0.0
	India	U.S.	2.5%	.78
	Indonesia	Japan	7.0%	.73
	Israel	U.S.	12.8%	-.49
	Mexico	U.S.	27.1%	.14
	Nigeria	U.S.	13.3%	-.52
	Pakistan	U.S.	3.6%	-.38
	Peru	U.S.	4.0%	.25
	Philippines	U.S.	15.2%	.44
	Poland	euro area	17.2%	.40
	Romania	euro area	17.6%	-.16
	Russia	euro area	12.4%	-.25
	South Africa	euro area	5.7%	-.10
	South Korea	U.S.	8.7%	-.39
Thailand	U.S.	11.7%	-.55	
Venezuela	U.S.	11.1%	-.68	

Source: International Monetary Fund, *International Financial Statistics*

Note: Data are for 1999 except ; correlation is between 1990-1999 except for ex-Soviet bloc countries, in which case correlation is between 1993-1999 to exclude transition period. Currency arrangement is identified as of 1999; some countries have changed since. Israel and Venezuela officially peg their exchange rates within a band; since this band is large (7.5% and 20%, respectively) they have been classified in this report as maintaining floating exchange rates.