

Third Draft

**EXCHANGE RATE SYSTEMS IN EMERGING
ECONOMIES***

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I. Introduction

The purpose of this paper is to discuss, within the context of the reforms of the “financial architecture,” exchange rate policies in emerging economies. I am particularly interested in understanding the relationship between exchange rate policies and currency crises. This analysis is helpful for determining the type of exchange rate practices – or more generally, policy packages – that should be strongly discouraged (*ex ante*) by the IMF, as a way of reducing policy-making moral hazard. The paper draws on my own work on exchange rates in emerging markets during the last dozen years, as well as on contributions by other academics and policy analysts.

One of the key issues in redefining the “architecture,” is devising a set of rules that would reduce the frequency and intensity of currency crises. In particular, the new incentive structure should be aimed at minimizing the extent of “moral hazard” currently embedded in the international system. Most discussions on this issue have focused on private sector behavior. Indeed, recent attempts to “bail-in” the private sector by asking it to share the burden of adjustment – such as in the case of Ecuador in September 1999--, are part of a broad official strategy aimed at changing incentives, and reducing private sector “moral hazard” in the future. IMF practices also affect policy makers’ behavior in the emerging economies. In fact, it is possible to argue that “moral hazard” is an equally – if not more – serious issue in the public than in the private sector. Indeed, by assisting countries in distress in a way that is largely independent of their pre-crisis behavior, the IMF tends to reward irresponsible behavior by emerging nations’ authorities. This issue is particularly serious with respect to exchange rate policies. Indeed, policy makers in the emerging nations are permanently tempted to adopt exchange rate policies that are (politically) beneficial in the short run, but highly costly in the longer run.¹ Pegging the exchange rate at an artificial level, and in the presence of an inconsistent fiscal policy is, perhaps, the most common example of this type of practice.

¹ It may be argued that since Finance Ministers that face a major crisis are often sacked, there is no serious policy making moral hazard. The problem with this line of reasoning, however, is that many of these policies are designed to benefit the political – as opposed to technocratic – leadership of a country. Moreover, many times these policies are undertaken towards the end of an administration.

The rest of the paper is organized as follows: In Section II I deal with the evolution of policy views on exchange rates in emerging nations. I argue that a “new consensus,” characterized by the following four elements, has recently emerged: (1) Exchange rates nominal anchors tend to generate an acute real appreciation; thus, they should only be used as a short-term transitional devise. (2) Countries that embark on these policies should have an “exit strategy.” (3) Exchange rate overvaluation is very costly, and has been at the heart of most recent currency crises. Defining effective methodologies to determine the presence of overvaluation is essential (4). In the longer run, pegged-but-adjustable exchange rate regimes are unstable, and invite speculation. Consequently, countries should opt either for floating rates or for super-fixity (currency boards or dollarization). In Section III, I discuss the evidence on the relationship between exchange rate regimes and economic performance in emerging economies. Section IV is devoted to the analysis of the two main alternatives to pegged-but-adjustable regimes: super-fixed systems and floating. Finally, in Section V I present a specific policy proposal for exchange rate policies in emerging economies. The proposal focuses both on the role of the IMF, as well as on country-specific policies.

II. The Emergence of a “New Consensus” View on Exchange Rates in Emerging Nations

The Mexican currency crisis of 1994 forced economists to thoroughly rethink the role of exchange rate policies in emerging countries. More specifically, as a result of the collapse of the Mexican peso in December of 1994, many economists questioned the merits of pegged-but-adjustable exchange rates, both in the short run –that is, during a stabilization program – as well as in the longer run. In this section I discuss the way in which policy thinking on exchange rates has evolved in the last five years or so.

II. 1 Exchange Rates as Nominal Anchors

In the late 1980s and early 1990s, and after a period of relative disfavor, rigid exchange rates made a comeback in policy and academic circles. Based on time-consistency and political economy arguments, a number of authors argued that fixed, or predetermined, nominal exchange rates provided an effective device for guiding a disinflation program and maintaining macroeconomic stability. According to this view,

an exchange rate anchor was particularly effective in countries with high inflation – say, high two digits levels – that had already tackled (most of) their fiscal imbalances.

Indeed, according to this view, a prerequisite for a successful exchange rate-based stabilization program, was that the country in question had its public finances in order. Mexico had done this as early as 1988, the year that exchange rate-based stabilization program known as the Pacto de Solidaridad was implemented in full force.²

However, a recurrent problem with exchange rate-based stabilization programs – and one that affected the countries of the South American cone during the early 1980s—is that inflation tends to have a considerable degree of inertia. That is, in many cases, domestic prices and wages will continue to increase even after the nominal exchange rate has been fixed. This, in turn, will result in a decline in exports' competitiveness, as domestic costs will rise at a faster pace than proceeds from exports. This means then that for an exchange rate anchor program to succeed, inflationary inertia has to disappear or, at the very least, decline significantly. This, in turn, will require that indexation mechanisms – both formal and informal – be eliminated, and that the stabilization program itself is highly credible. As Edwards (1998) has shown, the violation of either of these two requirements will generate a secular real exchange rate appreciation, that will eventually be translated into a major overvaluation. Indeed, Edwards (1998) study of the dynamics of inflation in two prominent exchange rate anchor episodes – Chile in the 1977-82 and Mexico 1988-94 --, indicates that in neither case was the degree on inflationary inertia significantly reduced after the adoption of the program. In both cases the program eventually failed and had to be abandoned

Dornbusch (1997, p. 131) forcefully discussed the dangers of exchange rate anchors in his analysis of the Mexican crisis:

“Exchange rate-based stabilization goes through three phases: The first one is very useful...[E]xchange rate stabilization helps bring under way a stabilization...In the second phase increasing real appreciation becomes apparent, it is increasingly recognized, but it is inconvenient to do something...Finally, in the third phase, it is too late to do something. Real appreciation has come to a

² Parts of this section greatly expand the discussion in Edwards (1999).

point where a major devaluation is necessary. But the politics will not allow that. Some more time is spent in denial, and then – sometime – enough bad news pile up to cause the crash.”

An additional complication is that under rigid exchange rates, negative external shock can result in a costly adjustment process. In a country with fixed exchange rates the authorities should react to a negative shock – a worsening of the terms of trade or a decline in capital inflows—by tightening monetary and fiscal policies, until external balance is re-established. A direct consequence of this is that economic activity will decline significantly, and the rate of unemployment will tend to increase sharply. If the country is already suffering from an acute overvaluation, this kind of adjustment becomes particularly painful and politically difficult. More often than not countries that face this situation will tend to postpone the required macroeconomics tightening, increasing the degree of vulnerability of the economy.

In their analysis of the Mexican crisis, Sachs, Tornell and Velasco (1995 p. 71) argue that it is “hard to find cases where governments have let the [adjustment process under fixed exchange rate] run its course.” This, according to them, reduces the degree of credibility of pegged exchange rate regimes, and provides a good argument for adopting more flexible ones.

In the mid-1990s, even as professional economists in academia and the multilateral institutions discussed the dangers of pegged but adjustable rates, policy makers in the emerging economies continued to favor that type of policies. In spite of Mexico’s negative experience with a rigid exchange rate regime, the five East Asian nations that eventually run into a crisis in 1997 had a rigid—de facto, pegged or quasi pegged—exchange rate system with respect to the US dollar. Whereas this system worked relatively well while the US dollar was relatively weak in international currency markets, things turned to the worse when, starting in mid 1996, the dollar began to strengthen relative to the Japanese yen. Naturally, as the dollar appreciated relative to the yen, so did those currencies pegged to it.

II.2 On the Dangers of Real Exchange Rate Overvaluation

The Mexican and East Asian crises underscored the need of avoiding overvalued exchange rates—that is, real exchange rates that are incompatible with maintaining

sustainable external accounts. In the spring 1994 meetings of the Brookings Institution Economics Panel, Rudi Dornbusch argued that the Mexican peso was overvalued by at least 30 percent, and that the authorities should rapidly find a way to solve the problem. In that same meeting, Stanley Fischer, soon to become the IMF's First Deputy Managing Director, expressed his concerns regarding the external sustainability of the Mexican experiment. Internal U.S. government communications released to the U.S. Senate Banking Committee during 1995 also reflects a mounting concern among some U.S. officials. Several staff members of the Federal Reserve Bank of New York, for example, argued that a devaluation of the peso could not be ruled out.³

In their analysis of the Mexican crisis and its sequel during 1995, Sachs, Tornell and Velasco (1996) also emphasized the role of real exchange rate overvaluation; according to their computations, during the 1990-94 period the Mexican peso was overvalued, on average, by almost 29 percent (see their table 9). An ex-post analysis by Ades and Kaune (1997), using a detailed empirical models that decomposed fundamentals' changes in permanent and temporary, indicates that by the fourth quarter of 1994 the Mexican peso was overvalued by 16 percent.⁴

Sachs, Tornell and Velasco (1996) have argued that by late 1994 the real exchange rate picture in the East Asian countries was mixed and looked as follows: While the Philippines and Korea were experiencing overvaluation, Malaysia and Indonesia had undervalued real exchange rates, and the Thai Baht appeared to be in equilibrium. In a recent study Chinn (1998) used a standard monetary model to estimate the appropriateness of nominal exchange rates in East Asia before the crisis. According to his results, in the first quarter of 1997 Indonesia, Malaysia and Thailand had overvalued exchange rates, while Korea and the Philippines were facing undervaluation. After the Mexican crisis of 1994, analysts in academia, the multilaterals and the private sector redoubled their efforts to understand real exchange rate behavior in emerging economies. Generally speaking, the RER is said to be "misaligned" if its actual value exhibits a (sustained) departure from its long run equilibrium. The latter, in turn, is

3 See D'Amato (1995).

4 In Edwards (1989) and Edwards and Santaella (1993) I had documented the connection between real exchange rate overvaluation and currency crises for more than 70 developing countries during the 1950-1982 period.

defined as the real exchange rate that, for given values of “fundamentals,” is compatible with the simultaneous achievement of internal and external equilibrium (Edwards 1989).

Most recent efforts to assess misalignment have tried to go beyond simple versions of purchasing power parity (PPP). Accordingly to a recently published World Bank book (Hinkle and Montiel 1999), one of the most common methods for assessing real exchange rates is based on single equation econometric estimates (see the appendix to this paper for a detailed presentation of this methodology). An analysis based on this methodology has been recently implemented by Goldman-Sachs (1997). The first version of this model, released in October of 1996 – almost eight months before the eruption of the East Asian crisis --, indicated that the real exchange rate was overvalued in Indonesia, the Philippines and Thailand. Subsequent releases of the model incorporated additional countries, and suggested that the Korean won and the Malaysian ringgit were also (slightly) overvalued. In mid 1997, Goldman-Sachs introduced a new refined version of its model; according to these new estimates, in June of 1997 the currencies of Indonesia, Korea, Malaysia, the Philippines, and Thailand were overvalued, as were the currencies of Hong Kong and Singapore. In contrast, these calculations suggested that the Taiwanese dollar was undervalued by approximately 7 percent. Although according to G-S, in June 1997 the degree of overvaluation was rather modest in all five East Asian-crisis countries, it had been persistent for a number of years: in Indonesia the real exchange rate had been overvalued since 1993, in Korea in 1988, in Malaysia in 1993, in the Philippines in 1992, and in Thailand since 1990 (See Edwards and Savastano 1999 for a review of other applications of this model to assessing real exchange rate overvaluation).

Although the methodology described here represents a major improvement over simple PPP-based calculations, it is still subject to a number of limitations. The most important one is that, as is the case in all residuals-based models, it assumes that the real exchange rate is, on average, in equilibrium during the period under study. This, of course, needs not be the case. Second, this approach ignores the role of debt accumulation, and of current account dynamics. Third, the more simple applications of this model ignore the major jumps in the real exchange rate, following a nominal

devaluation. This, in turn, will tend to badly bias the results, and will tend to generate misleading predictions. A fourth shortcoming of these models is that they do not specify a direct relationship between the estimated RER* and measures of internal equilibrium, including the level of unemployment. And fifth, many times this type of analysis generate results that are counterintuitive and, more seriously perhaps, tend to contradict the conclusions obtained from more detailed country-specific studies (see Edwards and Svastano 1999 for a detailed discussion).

An alternative approach, sometimes associated with the IMF, consists of calculating the “sustainable” current account deficit, as a prior step to calculating the equilibrium real exchange rate. This model relies on (rather simple) general equilibrium simulations, and usually does not use econometric estimates of a real exchange rate equation. Its major limitation is that it is not straightforward – in fact it is difficult and controversial – to what is the sustainable *path* of the current account.

The above discussion reflects quite vividly the eminent difficulties in assessing whether a country’s currency is indeed out of line with its long term equilibrium. These difficulties are more pronounced under pegged or fixed exchange rate regimes, than under floating ones.

II.3 Pegged Exchange Rates and Exit Strategies

In the mid 1990s, the notion that (most) exchange rate anchors eventually result in acute overvaluation prompted many analysts to revise their views on exchange rate policies. A large number of authors argued that, in countries with an inflationary problem, after a short initial period with a pegged exchange rate, a crawling peg should be adopted. This position was taken, for example, by Dornbusch (1997, p 137), who said “crawl now, or crash later.” The late Michael Bruno (1995 p.282), then the influential Chief Economist at the World Bank said that “[t]he choice of the exchange rate as the nominal anchor only relates to the initial phase of stabilization.” Bruno’s position was greatly influenced by his own experience as a policy maker in Israel, where in order to avoid the overvaluation syndrome a pegged exchange rate had been replaced by a sliding, forward-looking crawling band in 1989.

The view that a pegged exchange rate should only be maintained for a short period of time, while expectations are readjusted, has also been taken by Sachs, Tornell

and Velasco (1995) who argued that “[t]he effectiveness of exchange rate pegging is probably higher in the early stages of an anti-inflation programme...” Goldstein (1998 p. 51), maintained that “all things considered, moving toward greater flexibility of exchange rate at an early stage (before the overvaluation becomes too large) will be the preferred course of action...”

In 1998 the IMF published a long study on “exit strategies,” where it set forward the conditions required for successfully abandoning a pegged exchange rate system (Eichengreen et al. 1998). This important document made three points: (1) Most emerging countries would benefit from greater exchange rate flexibility. (2) The probability of a successful exit strategy is higher if the pegged rate is abandoned at a time of abundant capital inflows. And (3) countries should strengthen their fiscal and monetary policies before exiting the pegged exchange rate. This document also pointed out that since most exits happened during a crisis, the authorities should devise policies to avoid “overdepreciation.”

The most difficult aspect of orderly exits – and one that is not discussed in detail in the 1998 IMF document --, is political. Indeed, political authorities tend to focus on short term horizons, and usually discount the future very heavily. This is particularly the case in the emerging economies, where Central Banks lack the degree of independence that many (but not all) industrial countries’ Central Banks have. Moreover, in the few emerging nations where the Central Bank is independent, exchange rate policy is determined by the politically appointed minister of finance. This, for instance, was the case in Mexico.

The use of the exchange rate as a nominal anchor during a stabilization program has both costs and benefits. The greatest benefits are that a pegged exchange rate guides inflationary expectations down, and that it imposes a ceiling on tradable goods’ prices. There is ample empirical evidence suggesting that these positive effects of a nominal anchor are particularly high during the early stages of a disinflation program (Kiguel and Liviatan, 1996). As times goes by, and as inflation declines, these benefits will also decline. On the other hand, the more important cost of relying on an exchange rate nominal anchor is given by the fact that, in the presence of (even partial) inflationary inertia, the real exchange rate will become appreciated, reducing the country’s degree of

competitiveness. To the extent that the real appreciation is not offset by changes in fundamentals, such as higher productivity gains, the cost of the anchor will tend to increase through time. Figure 1 provides a simple representation of this situation of declining benefits and increasing time-dependent costs of an exchange rate anchor (C denotes costs and B refers to benefits). The actual slopes of these curves will depend on structural parameters and on other policies pursued by the country. These would include the country's degree of openness, the role of expectations, the fiscal stance, and the degree of (formal and informal) indexation. In Figure 1, the two schedules cross at time τ , which becomes the "optimal" exit time. Three important points should be noted. First, changes in the conditions faced by the country in question could indeed shift these schedules, altering the optimal exit time. Second, it is possible that, for a particular constellation of parameters, the two schedules don't intersect. Naturally, this would be the case where the optimal steady-state regime is a pegged exchange rate. And third, "private" cost and benefits may be different from "social" costs and benefits. That would be the case when, due to political considerations, the authorities are subject to "short-termism." In this case, benefits will tend to be overestimated and costs underestimated, resulting in a postponement of the optimal exit. Postponing the exit could – and usually does – result in serious costs, in the form of bankruptcies, major disruptions in economic activity and, in some cases, the collapse of the banking system (Edwards and Montiel 1989).

II.4 The "Death" of Middle-of-the-Road Exchange Rate Regimes

After the East Asian, Russian and Brazilian crises, economists' views on nominal exchange rate regimes continued to evolve quite rapidly. Fixed-but-adjustable regimes rapidly lost adept, while the two extreme positions—super-fixed (through a currency board or dollarization), and floating rates gained in popularity. Interestingly enough, the support for these regimes is largely based on the shortcomings of the intermediate systems – pegged-but-adjustable, managed float and (narrow) bands --, and not on their own historical merits. Indeed, in emerging markets there have been very few historical experiences with either super-fixity or with floating. Among the super-fixers, Argentina, Hong Kong and Estonia have had currency boards and Panama has been dollarized. This is not a large sample. Among floaters, the situation is not better. Only Mexico has had a

somewhat longish experience with a somewhat flexible rate (1995 to date), and most of it has taken place during periods of high international turmoil.

Eichengreen et al (1998 p. 3-4) capture the IMF view regarding exchange rate regimes quite vividly:

“Experience has repeatedly shown that an adjustable peg or a tightly managed float with occasional large adjustments is a difficult situation to sustain under circumstances of capital mobility...In a situation of high capital mobility, the exchange regime needs to be either a very determined peg...or it needs to be a managed float where the exchange rate moves regularly in response to market forces...”

Notice that, although these authors reject intermediate regimes, they fall considerably short of endorsing a free float. Indeed, in discussing the most appropriate policy action in emerging economies, they argue that market forces should be supplemented with “some resistance from intervention and other policy adjustments (p. 4)”

Current skepticism regarding pegged-but-adjustable regimes is partially based on the effect that large devaluations tend to have on firms’ balance sheets and, thus, on the banking sector. As the experience of Indonesia dramatically showed, this effect is particularly severe in countries where the corporate sector has a large debt denominated in foreign currency.

Calvo (1999b) has offered one of the very few theoretical justifications for ruling out middle-of-the road exchange rate regimes. He has argued that in a world with capital mobility, and poorly informed market participants, emerging countries are subject to rumors, runs and (unjustified) panics. This is because these uninformed participants may – and usually will – misinterpret events in the global market. This situation may be remedied, or at least minimized, by adopting a very transparent and credible policy stance. According to Calvo (1999b) only two type of regimes satisfy this requirement: super-fixes, and in particular dollarization, and a (very) clean float. In section IV of this paper I discuss in great detail the most important issues related to this view.

III. Exchange Rate Regime in Emerging Economies: The Evidence

In this section I discuss the existing evidence on the relationship between exchange rate regimes and economic performance in emerging countries. While most textbooks consider two alternative, and vaguely defined, exchange rate regimes, reality is much more complex than that. In Table 1 I present a list of ten alternative exchange rate regimes that have been adopted by different countries around the world during the last twenty years. The table ranks the regimes according to their degree of flexibility.⁵ It describes briefly the main features of each regime, summarizes their (alleged) advantages and shortcomings, and mentions a few relevant historical experiences. With the exception of “free floating,” the emerging countries have recently been represented by every category in the table. This table makes clear two things. First, simple categories – including those considered by the IMF – do not do justice to the degree of complexity of today’s real world. Second, there are blurred boundaries between many of these regimes, making any attempt to empirically determine the merits of alternative regimes extremely difficult.

During the last fifteen years or so the number of emerging countries that peg to a single currency has declined significantly – from more than 75% in the early 1980s, to less than 40% in 1998 (Edwards and Savastano 1999). However, in spite of this move away from quasi-fixity, even today the bulk of cases are concentrated around the middle categories (regimes 4 through 8 in Table 1).

The steady move away from currency pegs experienced during the last fifteen years reflects two phenomena: On the one hand, the rapid inflation of the 1970s and early 1980s were incompatible with fixed rates, forcing many countries – including long-time fixers, such as the Central American nations – to abandon the parity. And second, in the early and mid 1990s it became apparent that there are inherent tensions between high capital mobility and fixed exchange rates. A number of recent studies that examine the factors behind the developing countries’ shift toward more flexible exchange rate arrangements from a political economy perspective—see Collins, 1996, Edwards, 1996,

5. Of course, the table presents one of many possible taxonomies of exchange rate regimes. For alternative classifications along the criteria advanced in the (earlier) literature on the choice of exchange rate regimes see Isard, 1995 (chapter 11) and Eichengreen and Masson, 1998.

and Klein and Marion, 1997. An important insight emphasized by these studies is that the switch from traditional currency pegs to “more flexible” arrangements has had the effect of lowering the (perceived and actual) political cost of exchange rate changes that is normally borne by the authorities. By “de-politicizing” exchange rate movements, the argument goes, the authorities of these countries have become better equipped to respond to external shocks. These studies have also been careful in pointing out that the switch away from “fixity” has rarely entailed the adoption of freely floating exchange rates and, thus, nominal exchange rates in these countries have remained under administrative control.

A number of authors have analyzed the relationship between exchange rate regimes and economic performance in the developing countries. Early studies distinguished between two broadly-defined regimes: fixed and flexible rates. “Fixed” referred to fix-but-adjustable, while adjustable mostly depicted different variants of crawling peg. In this section I discuss briefly the evidence that has emanated both from individual as well as from cross-country studies.⁶

For many years, most of the evidence on the relationship between regime and performance came from descriptive analyses of individual countries’ experiences. Some large cross-country studies sponsored by the World Bank—notably those of Choksi et al., 1989 and Little et al., 1993--also included information on performance under alternative regimes. Most of this country-specific literature found it very difficult to pin down the *independent* effects of the nominal exchange rate regime on the overall macro performance of developing countries.

As the diversity of experiences increased during the 1970s and 1980s, researchers were able to use larger samples—both in terms of countries and years—to evaluate performance under alternative exchange rate systems. Edwards (1993), for example, used a sample of 52 developing countries to investigate whether, as suggested by the time consistency-based models, a fixed – meaning, again, pegged-but-adjustable—exchange rate regime delivered lower rates of inflation than more flexible regimes. Edwards noted that this type of cross-country analysis was potentially subject to a serious “survival

6. For greater details see, for example, Edwards and Savastano (1999).

bias.” The problem is that only countries that have successfully defended their peg are included in the “fixed exchange rate” category. On the other hand, countries that adopted a fixed exchange rate, but failed to sustain it, are usually classified as having a “flexible regime.” This means that high inflation rates generated by exchange rate “crashes” are incorrectly attributed to the flexible rate system. This problem was also noted by Aghevli, et al., 1991 who, after arguing that “the inflation performance of the countries that have operated under a fixed exchange rate regime has been, on the whole, superior to that of the group operating under more flexible arrangements,” added that this type of conclusion “neglects the experience of countries that initially adopted a pegged arrangement, but were forced to abandon it” (page 13).⁷

As part of a comprehensive cross country study on inflation and stabilization in 18 developing countries, Little, Corden, Cooper and Rajapatirana, (1993) investigated whether fixed exchange rates discouraged inflation. Although they recognized the “reverse causality” problem, they conducted their analysis at a simple descriptive level, without making a formal attempt at dealing with the problem. After looking at the data from different angles they came to the perhaps obvious but nonetheless valuable conclusion that it was not possible to make generalizations. While in some countries a fixed exchange rate had been associated with a lower rate of inflation, in other “episodes the exchange rate was clearly not an effective “nominal anchor” (page 245). In addition, they made the important point that all analyses of country performance under alternative exchange rate regimes, should take into account the role of capital mobility. In fact, they suggested that their conclusions were most relevant for countries where the degree of capital mobility was somewhat limited.

In a broad and comprehensive multi-country investigation Ghosh et al. (1995) used data from 136 countries during the period 1960-89 -- more than 3,600 annual

7. Edwards, 1993 attempted to address this survival bias by examining whether, after controlling for other variables, countries that had a fixed exchange rate during the first year (1980) of a ten-year period (1980-89) had a lower average rate of inflation for the decade as a whole. He found that countries with a fixed exchange rate indeed experienced a lower average rate of inflation (the regression coefficient of the dummy variable for a fixed exchange rate in 1980 was -0.7). This effect, however, seemed to depend on the country's inflation history: the inclusion of an interactive regression term suggested that at levels of past (historical) inflation equal to or higher than 20 percent, fixed exchange rates lost their macroeconomic discipline effect.

observations -- to examine the effects of the nominal exchange rate regime on inflation and growth. The authors compute unconditional and conditional means for the rates of inflation and output growth in the countries in the sample grouped and classified according to the degree of flexibility of their nominal exchange rate, as well as by their level of income. The authors check whether (a subset of) their results suffer from a problem of “reverse causation” (simultaneity bias), and also examine the effects that the regime may have on the volatility of inflation and output growth. The study finds that the inflation rate is indeed significantly lower and less volatile under pegged exchange rates than under “more flexible” arrangements, even after controlling for the effects of money growth and interest rates. They also find that both output growth and employment are more volatile under pegged exchange rates than under flexible rates; they find no differences in the rate of growth of GDP, however.

A very important finding of this study is that the “inflation bias” of flexible exchange rate arrangements does not seem to be present among the “pure floaters” in the sample—especially among the high- and upper-middle-income ones. This result clearly suggests that the positive correlation between exchange rate flexibility and inflation detected in the study may not be monotonic.

A more recent IMF study that extends the period of analysis to the mid-1990s reports similar findings: over the past two decades, inflation has been consistently lower and less volatile in developing countries with pegged exchange rates than in those with more flexible arrangements, but there are no clear differences in the growth performance across the two groups (IMF, 1997). Although those conclusions are based on rather crude comparisons of the evolution of the median rates of inflation and output growth in countries with “pegged” and “flexible” exchange rate arrangements from 1975 to 1996, the evidence presented in this study suggests that the main findings reported by Ghosh et al., 1995 were not greatly affected by the increased access to international capital markets gained by developing countries in the 1990s. Indeed, it appears that the differences in macroeconomic performance across nominal exchange rate regimes in developing countries continue to boil down to differences in the inflation performance of the countries in each group, and that those differences seem to be getting smaller over time.

The results reported above are subject to a number of methodological limitations and should, thus, be interpreted with care.⁸ Some of the more serious shortcomings of this literature are: First, and as noted, the majority of studies classify nominal exchange rate regimes following the countries' *official* description of their exchange rate system (typically the one they report to the IMF) rather than on the basis of the *actual* degree of flexibility of their nominal exchange rates. Discrepancies between *de jure* and *de facto* (performance-based) classification of regimes, however, are often substantial; moreover, the sign and size of those discrepancies vary across countries and over time. Furthermore, to make things tractable, studies have to condense the 20-odd *de jure* categories of exchange rate arrangements reported in IMF sources into two or three broad types of regime (e.g., "pegged" and "flexible"), which can lead to important differences in the classification of the same regime across studies⁹. A second limitation is that, as also pointed out above, many of these studies implicitly assume that all exchange rate regimes in their sample were sustainable and that all changes in regime were voluntary. A consequence of this assumption is that the macroeconomic effects of all "regime switches" tend to be ascribed to the successor regime. In the emerging economies, however, changes in the exchange rate regime are rarely smooth events, and tend to have short-run adverse effects on inflation and output, especially when they involve a large devaluation (Edwards, 1989, Edwards and Montiel, 1989, Eichengreen and Masson, 1998). A third limitation of (most of) this literature is that the duration of the exchange rate regime is assumed to be immaterial for macroeconomic performance. Thus, for instance, observations corresponding to countries that somehow managed to hold on for a year or two to clearly inconsistent and unsustainable currency pegs are treated no different by observations pertaining to currency pegs that have been in place for several decades, such as the countries in the CFA zone. And fourth, there is the problem of endogeneity of the choice of exchange rate regime or "reverse causation." The key

8. This applies both to studies that focus on the relationship between nominal exchange rate regimes and macroeconomic performance, as well as to those mentioned earlier that attempt to explain the increased demand for "more flexible" exchange rate arrangements from a political economy angle.

9. For example, countries with a *de jure* exchange rate system of "single currency peg with frequent changes in parity" are classified as "pegged" by Ghosh et al., 1995 and as "flexible" in a related study by Cottarelli and Giannini, 1997.

question is whether “fixed” exchange rates deliver low inflation by adding discipline and credibility to the conduct of macroeconomic policies. Or is it that countries with low inflation choose pegged exchange rates, perhaps to signal their intention to maintain their anti-inflationary stance? A similar problem arises in the case of output growth, despite the difficulties of empirical studies for finding any clear link between growth and the exchange rate regime. Do fixed exchange rates foster economic growth—say, by delivering an environment of low inflation and low relative price variability? Or do fast-growing countries choose fixed exchange rates so as to further reduce relative price variability and, hence, increase the horizon and efficiency of investment decisions?

Although some recent studies (notably those of Ghosh et al., 1995 and Edwards, 1993, 1996) have made serious attempts to control or check for a possible simultaneity, the above noted problems in the classification of those regimes and in the treatment of “regime switches” are just two of many possible sources of sample selection bias that remain largely unaddressed. All considered, it seems that a satisfactory solution to the “reverse causation” problem in studies of the relationship between exchange rate regimes and macroeconomic performance in developing countries will require, at a minimum, many more, longer, and better defined episodes of fixed and flexible exchange rates in those economies than what is currently available.

A key message this discussion is that what this literature has called “flexible exchange rates” is really a mixed bag. Until (very) recently, there were almost no experiences with floating rates – categories 1 or 2 in Table 1 – among the developing nations. In fact, the great majority of nominal exchange rates considered “flexible” in empirical studies have been heavily managed and/or directly set by the authorities. In addition, most studies have had difficulties trying to capture the independent effects of exchange rate regimes on macroeconomic performance. For example, empirical studies will often lump together in the “flexible exchange rate” category countries with nominal exchange rates that are as stable as *de jure* pegs (i.e., the case of many East Asian countries in the years before the 1997 crises), as well as countries undergoing high inflation, where exchange rates can do little else than move more or less in tandem with the other nominal variables of the economy (e.g., most Latin American countries in the 1980s).

From the perspective of the current debate, however, the most serious limitation of the existing literature is that it is virtually silent with respects to the two regimes today favored by most analysts: super-fixity, *a la* currency board or dollarization, and floating exchange rates. This is hardly surprising – after all, there have been very few cases of currency boards, dollarization, or floating exchange rates. In Section IV of this paper I provide an analysis of some aspects of country experiences with these regimes.

IV. To Float or to Super-fix, that is the Question

As pointed out in Section II, an increasingly large number of analysts agree that, in a world of high capital mobility, middle-of-the-road exchange rate regimes – that is, pegged-but-adjustable and its variants, including (narrow) exchange rate bands – are prone to generate instability and end up in crisis. As a consequence, a large percentage of the economic profession supports the idea that emerging nations should opt for one of the two extremes: floating or super-fixed exchange rates. Generally speaking, whether a particular country should adopt a super-fixed or a floating system will depend on its specific structural characteristics, including the degree of de facto dollarization of the financial system, the extent of labor market flexibility, the nature of the pass-through coefficient(s), and the country’s inflationary history (Calvo 1999, Edwards 1999). In this section I discuss, in some detail, the experiences and prospects of super-fixed and floating exchange rate regimes in emerging economies. The section is organized in three parts: I first review some of the few experiences with super-fixed regimes—Argentina, Hong Kong and Panama. Although the analysis is not exhaustive and does not cover every angle of these countries’ experiences, it deals with some of the more salient, and less understood, aspects of these regimes. I then deal with the feasibility of floating rates in emerging economies. I do this by analyzing Mexico’s experience with floating rates since 1995. I investigate three specific issues: (1) Has Mexico’s exchange rate been “excessively volatile” since the peso was floated. (2) To what extent have exchange rate movements affected the conduct of Mexico’s monetary policy (that is, can we identify a monetary feedback rule). And (3), what has been the relationship between exchange rate and interest rate movements.

IV.1 Super-Fixed Exchange Rate Regimes: Myths and Realities

Supporters of super-fixed regimes – currency boards and dollarization—have argued that these exchange rate systems provide credibility, transparency, very low inflation and monetary and financial stability (Calvo 1999a, b, Hanke and Schuller 1999, Hausmann 1999). A particularly attractive feature of super-fixed regimes is that, in principle, by reducing speculation and devaluation risk, domestic interest rates will be lower and more stable than under alternative regimes. This will be reinforced to the extent that, as Hausmann (1999) has argued, the different risk premia are related among themselves, and a lower exchange risk is translated into a lower country risk premium. Moreover, if as Calvo (1999) has conjectured, the nature of external shocks is not independent of the exchange rate regime, and countries with more credible regimes face milder shocks, super-fixed economies will tend to be less prone to “contagion.” Lower and more stable interest rates, combined with enhanced credibility and financial stability will, in turn, result in an environment that will be more conducive to long term growth. Achieving credibility is not automatic, however. For super-fixed regimes to actually be credible, some key issues have to be addressed successfully:

- **Fiscal solvency.** In the stronger version of super-fixed models this is taken care-of almost automatically, as the authorities understand that they have no alternative but to run a sustainable fiscal policy. This is because the authorities are aware that the traditional recourse of reducing the real value of the public debt through a surprised devaluation is not any longer available. This imposed fiscal responsibility is, in fact, considered to be one of the most positive aspects of the super-fixed regime. However, the fiscal requirement has to go beyond solvency, and has to include specific operational aspects. In particular, the country in question has to develop an institutional setup that allows it to run counter-cyclical fiscal policies.
- **The lender of last resort function,** which under flexible and pegged-but-adjustable regimes is provided by the central bank, has to be delegated to some other institution. This may be a consortium of foreign banks, with which a contingent credit is contracted, a foreign country with which a monetary treatise has been signed, or a multilateral institution.

- Related to the previous point, in a super-fixed the regime the domestic banking sector has to be particularly solid, in order to minimize the frequency of banking crises. This can be tackled in a number of ways, including the implementation of appropriate supervision, the imposition of high liquidity requirements on banks, or by having a major presence of first-rate international banks in the domestic banking sector.
- Currency board regimes require that the monetary authority holds enough reserves – an amount that, in fact, exceeds the monetary base. Whether the authorities should hold large reserves under dollarization is still a matter of debate. What is clear, however, is that dollarization does not mean that the holding of reserves should be zero. The United States, the dollarized country by definition, indeed holds a non trivial stock of international reserves.

According to traditional models in the Mundell-Fleming tradition, a limitation of super-fixed regimes is that negative external shocks tend to be amplified. And, to the extent that it is difficult to engineer relative price changes, these external shocks will have a tendency to be translated into economic slowdown and higher unemployment. The actual magnitude of this effect will, again, depend on the structure of the economy and, in particular, on the degree of labor market flexibility. Some authors have recently argued, however, that these costs have been exaggerated and that, in fact, relative price changes between tradable and nontradable goods can be achieved through the simultaneous imposition of (uniform) import tariffs and export subsidies.¹⁰ Calvo (1999b, p 21) has gone as far as arguing that the existence of nominal price rigidity may be a blessing in disguise, as it allows adjustment in profits to occur slowly, smoothing the business cycle.

IV.1.1 Argentina's Currency Board

Argentina provides one of the most interesting (recent) cases of a super-fixed regime. In early 1991, and after a long history of macroeconomics mismanagement, two bouts of hyperinflation, and depleted credibility, Argentina adopted a currency board.

¹⁰ See Calvo (1999 b). From a practical perspective, however, there are important limits to this option. In particular, it will violate WTO regulations. Additionally, the use of commercial policy to engineer relative price adjustments will have serious political economy implications. On the equivalence of this type of commercial policy package and exchange rate adjustments see Edwards (1988, p. 31-32).

This was seen by many as a last resort-measure for achieving credibility and stability. After a rocky start – including serious contagion, stemming from the Mexican crisis in 1995 --, the new system became consolidated during the year 1996-97. Inflation plummeted, and by 1996 it had virtually disappeared; in 1999 the country, in fact, faced deflation and will post a negative CPI inflation of almost –2%.

In Argentina, the lender of last resort issue has been addressed in three ways. First, banks are required to hold a very high “liquidity requirement;” second the Central Bank has negotiated a substantial contingent credit line with a consortium of international banks. And third, there has been a tremendous increase in international banks’ presence: seven of Argentina’s eight largest banks are currently owned by major international banks.¹¹

After the adoption of the currency board and the rapid decline in inflation, the country experienced a major growth recovery, posting solid rates of growth in 1991-1994. In 1995, however, and largely as a consequence of the Mexican “Tequila” crisis, the country went into a severe recession, with negative growth of 3 percent. It recovered in 1996-97, only to once again fall into a recession in 1998-99, this time affected by the Russian and Brazilian currency crises and by increasing doubts on the country’s ability to deal with its fiscal and external problems. In 1999 GDP will contract by almost 4%, and in 2000 it is expected to post very modest growth. The combination of these external shocks and some structural weaknesses—including an extremely rigid labor legislation – resulted in a very high rate of unemployment. It exceeded 17 % in 1995-96, and it has almost averaged 15% during 1999.

Devaluation Risk and Exchange Rates: Contrary to the simplest version of the model, exchange rate risk did not disappear after Argentina adopted a currency board. This is illustrated in Figure 2, where interest rate differential between peso and dollar denominated 30-day deposits paid by Argentine banks from 1993 through October 1999 are presented. As may be seen, this differential experienced a major jump immediately after the “Tequila crisis,” exceeding 1400 basis points. Although it subsequently declined, it continued to be very high and volatile. During the first ten months of 1999, for example, the 30-day peso-dollar interest rate differential averaged 140 basis points.

During the last few years Argentine (real) domestic interest rates have been relatively high and volatile. Indeed, and as may be seen in Figure 3, since 1997 the 90 days deposit rate in Argentina has been higher, on average, than in Chile, a country that has followed a policy on increased exchange rate flexibility.¹² This figure also shows that, except for a short period in 1998, Argentina's 90 days interest rates have been more volatile than Chile's equivalent rates. Furthermore, during the last three months of 1999, Argentine real interest rates have exceeded those in Mexico, the Latin American country with the longest experience with floating rates (see the next subsection for a discussion on Mexico.) In the last few years, and even after the currency board had been consolidated, Argentina's country risk – measured, for example, by the spread of its Brady Bonds – has also been high and volatile (See Figure 4 for daily Argentine Brady's spreads for January 1995- May 1999).

Vulnerability and Contagion: As noted above, supporters of super-fixed regimes have argued that to the extent that the regime is credible, the country in question will be less vulnerable to external shocks and “contagion.” This proposition is difficult to test, since it is not trivial to build an appropriate counterfactual. What can be done, however, is compare the extent to which countries that are somewhat similar – except for the exchange rate regime – are affected by common international shocks. I recently estimated a series of (quasi) structural VARs to investigate the way in which shocks to international country risk – measure through changes in JP Morgan's EMBI indexes – impacted on domestic interest rates in Argentina, Chile and Mexico.¹³ The estimation period was from January 1996 through September 1st 1998; the turbulence of both the Mexican and Brazilian crises were thus excluded from the estimation. The results obtained clearly indicate that a one standard deviation to Latin America's regional risk premium affected Argentina domestic interest rates significantly. In fact, this effect was larger than in

11 These eight banks, in turn, account for approximately 50% of deposits.

12 Throughout most of the 1990s Chile had a system with very broad bands. These were eliminated in September, 1999, and the Chilean peso has floated since.

13 These results were presented at the 1999 World Economy Lecture at the University of Nottingham, and are available on request. These three countries had different exchange rate regimes during the period under study. While Argentina had a currency board, Chile had a bands system with increased flexibility, and Mexico had a floating exchange rate system.

Chile, a country that has had a significant degree of exchange rate flexibility.¹⁴ Also, in a recent five-country study on the international transmission of financial volatility, Edwards and Susmel (1999) found that Argentina has been the country most seriously affected by volatility contagion – the other countries in the study are Brazil, Chile, Mexico and Hong Kong.¹⁵ Interestingly enough, this study also found that Hong Kong, the most revered of the super-fixers, has also been subject to important volatility contagion during the last five years.

Competitiveness, Fiscal Policy and Credibility: Analysts have emphasized two factors as possible explanations for Argentina’s financial instability during the last few years. An accumulated real exchange rate overvaluation and an inability to bring the fiscal accounts under control.

Figure 5 presents Goldman-Sachs estimation of Argentina equilibrium RER, as well as its actual (trade weighted) RER for 1985-1999 (for the exact methodology used by Goldman Sachs, see Ades 1996; see also the discussion in the appendix to this paper). In this figure if the equilibrium RER exceeds the actual RER, the currency is overvalued. As may be seen, according to these calculations until early 1999, Argentina suffered a significant overvaluation. Independently of the actual relevance and “accuracy” of these specific estimates, the belief that Argentina had accumulated a significant real exchange rate disequilibrium, had a negative effect on expectations and the regime’s degree of credibility.

Sine 1996 Argentina has run increasingly larger fiscal deficits and has systematically exceeded its own—and successive IMF program’s – deficit targets. This has resulted in a rapidly growing public sector debt, and in swelling external financing requirements. These two factors, plus the inability to make progress in key structural reform areas, such as labor market legislation, have been translated in successive bouts of low credibility, and instability.

IV.1.2 Panama and Dollarization

In 1998 analysts and politicians – including Argentina’s President Carlos Menem—concluded that Argentina’s credibility problems could be tackled by taking one

¹⁴ A limitation with this test is that, not all other things are maintained constant, as we would ideally want. In particular, during the period under study Chile had controls on capital inflows.

more step towards exchange rate super-fixity, and adopting the U.S. dollar as the sole legal tender. Supporters of this “dollarization” project pointed out to Panama’s remarkably low inflation as living proof of the merits of that system. What was surprising, however, was that this early support for dollarization was not based on a serious evaluation of the Panamanian case. More specifically, what admirers of this experience did not know –or did not say—was that Panama’s monetary arrangement has survived largely thanks to IMF support. In effect, with the exception of a brief interregnum during the Noriega years, Panama has been almost permanently under the tutelage of the Fund. Since 1973 Panama has had 16 IMF Programs, the most recent of which was signed in late 1997, and is expected to run until late 2000. According to a new paper by IMF senior officials Michael Mussa and Miguel Savastano, during the last quarter of a century Panama has been the most assiduous user of IMF resources in the Western Hemisphere; since 1973, only Pakistan has had a larger number of IMF programs. The main factor behind this proliferation of IMF programs has been Panama’s inability, until very recently, to control its public finances. Between 1973 and 1998 the fiscal deficit averaged 4% of GDP, and during 1973-1987 – a period of continuous IMF programs – it exceeded a remarkable 7% of GDP. In fact, it has only been in the last few years that Panama has been able to put its fiscal accounts in order.

In 1904 Panama adopted the dollar as legal tender. Although there is a national currency – the *Balboa* --, its role is largely symbolic. There is no central bank and the monetary authorities cannot issue *Balboa*-denominate notes. Since 1970 Panama has had no controls on capital mobility, and has been financially integrated to the rest of the world. Moreover, for decades Panama has been an important center for offshore banking, with a large number of international banks operating in the country. Panama’s most remarkable achievement – and one that is heralded by dollarization enthusiasts – is its very low rate of inflation. Between 1955 and 1998, it averaged 2.4% per annum, and during the 1990s it barely exceeded 1 percent per year. In addition to low inflation, Panama has posted a healthy rate of growth during the last four decades. Between 1958 and 1998, Panama’s real GDP expanded at 5.3 percent per year, and during the 1990s,

15 This study relied on switching conditional heteroskedastic autoreregression (SWARCH) techniques.

growth has been a full percentage point higher than that of the Latin American countries as a group – 4.4 vs 3.4 percent per year.

As pointed, however, behind these achievements hides Panama's serious historical addiction for IMF financing. In spite of not having a central bank, or a currency of its own, for years Panama failed to maintain fiscal discipline. Initially, these large fiscal deficits were financed through borrowing from abroad. And when the foreign debt became too high, the IMF stepped in with fresh resources. And when this was not enough, Panama restructured its foreign debt.

Panama had its first IMF Stand-By program in 1965. A year later, adjustment was achieved, and the fiscal deficit was brought into check. In 1968, however, the fiscal accounts were again out of hand, and the IMF was called in once more. A remarkable nineteen-year period of uninterrupted IMF programs was thus initiated. Year after year, a new IMF program called for the strengthening of public finances. And, invariably, year after year, Panama failed to take serious action. After all, the authorities knew that the IMF was there, ready to bail them out. This vicious circle was only broken in 1987, when as a result of General Noriega's confrontational policies and involvement in narcotics trafficking, Panama was subject to severe U.S.-led economic sanctions. The IMF returned to Panama in September of 1990, with a monitored program. This was followed by lending programs in 1992 (22 months), 1995 (16 months), and 1997 (36 months). Significantly, in the last few years the authorities have finally acknowledged the need of maintaining a solid fiscal position. Between 1990 and 1996 the country posted public sector surpluses, and in the last three years it has run modest deficits. It is too early to know, however, whether the recently inaugurated administration of President Mireya Moscoso will continue to strive for fiscal solvency or whether it will return to the practices of the past.

In contrast with Argentina, Panama has successfully eliminated devaluation risk. This has been reflected in a relatively low cost of capital in international financial markets. In that regard, it is illustrative to compare the spreads over U.S. treasuries of Brady bonds issued by Panama and Argentina. Between January 1997 and December 1998 the average daily spread on Panamanian par bonds was 464 basis points, significantly lower than that of Argentine par Brady bonds, which averaged 710 basis

points. The comparison between spreads over US 30 year Treasury Bonds, of Panamanian and Argentinian Brady par bonds.

It is very important to note, however, that although there is no devaluation risk in Panama, the country has been continued to be subject to sizable country risk and to contagion. In fact, as figure 6 shows, the spread over Treasuries of Panamanian Brady bonds has been volatile and has experienced important jumps in response to political shocks – such as the uncertainty over the President’s intentions to perpetuate himself in power in 1998 --, and external developments, including the Russian crisis of 1998. More to the point, the spread over Panamanian bonds has systematically been higher than that of Chile’s sovereign bond. And Chile, as has been pointed out, has been a country that during the period under discussion experienced an overall increase in the degree of exchange rate flexibility. A careful study of Panama’s monetary history suggests strongly that dollarization does not, on its own, assure fiscal solvency and prudence. This has to be accomplished through the creation of budget-related institutions.

Until recently, much of the discussion on dollarization has focused on the loss of seignorage that would result from unilateral dollarization. Supporters of the plan have argued that the way to deal with the seignorage issue, is to sign a monetary treatise with the United States, under which lost seignorage would be partially refunded to Argentina. This is not a new idea. In fact, it was proposed in 1972 by Harry Johnson within the context of the Panamanian experience. The problem, however, is that it is extremely difficult to believe that the US would politically accept such an arrangement. It stretches one’s imagination to believe that the U.S. Congress would go along with these payments. This all but means that if a particular country wants to dollarize – and I do believe that some of them are, in fact, good candidates --, it should do it on its own, without expecting for the signing of a monetary treatise with the U.S. This implies, however, that before taking the major step towards dollarization, care should be taken to learn from the Panamanian experience.

IV.2 On the Feasibility of Floating Exchange Rates in Emerging Economies: What Does Mexico's Experience Teach us?

For many years it has been argued that emerging countries cannot adopt successfully a floating exchange rate regime.¹⁶ Two reasons have traditionally been given for this position: first, it has been argued that since emerging countries' tend to export commodities and/or light manufactures, a floating exchange rate would be "excessively" volatile. Second, and related to the previous point, it has been argued that emerging countries don't have the institutional requirements for undertaking effective monetary policy under purely floating exchange rates (Krueger 1978). This means that emerging markets that float would be unable to implement the type of (rather complex) feedback rule required for implementing an effective inflation targeting system. After discussing the merits of floating rates and inflation targeting, Eichengreen et al (1998 p. 18-19) state:

"[I]t is questionable whether a freely floating exchange rate and an inflation target objective for monetary policy are feasible, advisable or fully credible for many developing and transition economies...[T]hese economies are subject to substantial larger internal and external shocks...and the transmission mechanisms through which monetary policy affects the economy and the price level tend to be less certain and reliable..."

More recently, a new objection to floating in emerging markets has been raised. Some authors, most notably Calvo (1999a,b) and his associates, have argued that in a world with high capital mobility, incomplete information, fads, rumors and a dollar-denominated liabilities the monetary authorities will be severely affected by a "fear to float." This is because significant exchange rate movements – and in particular large depreciations—will tend to have negative effects on inflation and on corporate debt. According to this view, in emerging markets floating regimes will be so only in name. In reality, countries that claim to float will be "closet peggers," making every effort, through interest rate manipulations, to avoid large exchange rate fluctuations. These countries will be in the worst of worlds: they will have a de-facto rigid exchange rates and high interest rates.

¹⁶ Here I am referring to "floating," as opposed to "flexible" regimes. In referring to "floating" I restrict myself to categories 1 and 2 in Table 1.

The paucity of emerging market experiences with true floating exchange rates – that is floating within categories 1 and 2 in Table 1 --, has severely limited economists' ability to inquire whether the concerns summarized above are warranted. Mexico's experience after the 1994 peso crisis provides an opportunity to gain some insights on behavior of floating exchange rates in emerging economies. Of course, it is not possible to extract general conclusions from a single episode, but in the absence of other experiences with anything that resembles a floating rate, analyses of Mexico's foray with exchange rate flexibility should prove very useful.

Figure 7 presents weekly data on the nominal exchange rate of the Mexican peso vis-à-vis the U.S. dollar for the period January 1992 through October 1999. The top panel depicts the nominal peso/dollar rate, while the bottom panel presents the weekly rate of devaluation of the Mexican peso during that period. These figures clearly show the heightened volatility that followed the currency crisis of December 1994. By late 1995, however, Mexico had managed to stabilize the Peso/Dollar rate. During the second of November, 1995 the peso/dollar rate was at 7.77, and almost two years later, during the second week of October 1997, it was 7.71. At that time, and partially as a result of the East Asian crisis the peso depreciated significantly. The peso continued to lose ground until October 1998, when in the midst of the global liquidity squeeze, the peso/dollar rate surpassed 10. Once global liquidity was restored the peso strengthened significantly, as the figure shows, and during October/November, 1999 it has fluctuated around the 9.3/9.4 mark.

Volatility: In Tables 2 and 3 present a series of indicators to compare the volatility of the peso/dollar rate with that of the DM, Japanese yen, British pound, Australian dollar, Canadian dollar, and New Zealand dollar/U.S. dollar rates, as well as that of the French Franc/DM rate. While Table 2 deals with daily exchange rate data, Table 3 presents volatility statistics for weekly data. Generally speaking, the results presented in these tables provide no support for the idea that the peso/dollar rate has been “excessively” volatile, after 1995. In fact, according to the mean absolute percentage change and the standard deviation of change, the peso dollar rate was among the less volatile exchange rates during 1996, and as volatile as the other currencies during 1997. In 1998, its degree of volatility increased significantly, but was lower than the yen/dollar

rate. In 1999 the extent of volatility declined, and the peso was once again in the middle of the pack. The overall conclusion from the high frequency volatility analysis is, then, that there Mexico does not appears to be different, in terms of volatility, from other floaters.

Monetary Policy, Feedback Rule and Transparency: The stabilization of the exchange rate at around 7.7 pesos per dollar in 1996 surprised many analysts. This was for two reasons. First, with a still rapid rate of inflation it was expected that the peso would continue to depreciate at a somewhat rapid pace. Second, the Bank of Mexico stated repeatedly that it was (almost completely) abstaining from intervening in the foreign exchange market. In fact the Bank of Mexico stated that between 1996-97 it never sold foreign exchange, and only on very few occasions it provided signals to the local financial market, suggesting that it would tighten liquidity. No “signals,” were provided during 1997.¹⁷

Market participants, however, were skeptical about the hands-off policy allegedly followed by the Bank of Mexico, and believed that, as it is often the case in industrial countries, there was a gap between what the Bank of Mexico said and what it actually did.¹⁸ In particular, by mid 1997 market analysts believed that the Bank of Mexico was following a complex monetary policy feed-back rule, that incorporated exchange rate behavior prominently. The Chief Economist of Bear Sterns stated in *the Wall Street Journal*: “Mexico stopped its economic and financial deterioration almost overnight [in the aftermath of the 1994 devaluation] by announcing a feedback mechanism between the exchange rate ... and ... monetary liquidity” (October 20, 1997 p. A.23). And JP Morgan’s *Emerging Markets Data Watch* of October 3, 1997 (page 6) noted that: “It has often been argued in the past year or two that Banxico has been exacerbating upward pressure on the peso by tightening monetary policy.” These analysts did not venture to opine on whether the feedback rule was of a Taylor-type, or whether it was of a looser,

17 See Edwards and Savastano (1998) for a detailed discussion of the bank of Mexico’s official description of the way in conducted monetary policy during that period. See also Aguilar and Juan-Ramon (1997).

18 In fact, trying to actually figure out what the Bundesbank did had become a small cottage industry among monetarist economists. See, for example, Clarida and Gertler (1997).

and yet more complex type, such as the ones advocated by supporters of inflation targeting in an open economy (Svensson, 1999).

Starting in 1995, the Bank of Mexico official monetary policy consisted of targeting the monetary base on a day-to-day basis. No attempt was made, according to the official view, at targeting interest rates, nor was the exchange rate a consideration in setting liquidity (O'Dogherty, 1997). This system is supposed to work as follows: early in the year the Bank of Mexico announces the day-to-day target for monetary base. This, in turn, is consistent with the official inflation goal, and incorporates expected changes in money demand and seasonality. If, for whatever reason, the Bank decides to alter its stance it does that by sending a "signal" to the banking sector. This is done by announcing, and thereafter enforcing, a (very) small change in the banking system cumulative balances (O'Dogherty 1997). What puzzled Mexico observers was the small number of episodes in which the Bank Of Mexico acknowledged having modified the stance of its monetary policy in response to market developments. By its own reckoning, the BOM changed the stance of monetary policy 15 times between September 25 and December 25, 1995, 8 times between December 1995 and November 1996, and kept the stance unchanged (at a "neutral" level—i.e., a cumulative balance of zero) during 1997 (Gil-Díaz (1997); Aguilar and Juan-Ramón (1997)). According to Mexico's monetary authorities, then, all movements of interest rates and the exchange rate in, say, 1997 (or in any other long period in between changes in the Bank of Mexico's objective for the system's cumulative balance) did not justify nor elicit a response of monetary policy. In a recent paper, Edwards and Savastano (1998) used weekly data to investigate whether, as stated, the Bank of Mexico followed mostly a hands-off monetary policy, or whether as market participants suspected, it followed some type of feedback rule. Their findings suggest, very strongly, that during 1996-97 the Bank of Mexico did follow a monetary policy feedback rule, where developments in the in the exchange rate market were explicitly taken into account when determining the amount of liquidity made available to the market. More specifically, the authors found that the Bank of Mexico tightened the monetary base, relative to its target, when the peso experienced a "large" depreciation. This analysis indicates that, although monetary policy responded to

changes in the peso/dollar exchange rate, the Bank of Mexico did not defend a specific level of the peso.

These results are important for three reasons: first, they clearly indicate that, contrary to the Mexican authorities' claims, the Central bank made a concerted effort to stabilize the peso. Second, the results also suggest that, in spite of the skeptic's view, in emerging economies it is possible for the monetary authority can implement an effective and complex feed back rule.¹⁹ And third, these results clearly illustrate that under a floating regime the issue of transparency – and more specifically, of verifiability – can be serious, and even highly destabilizing. In the case of the Mexican peso discussed above, the Economist (March 14-18, 1998 p. 17) pointed out that puzzled investors were not sure how to interpret the relative stability of the peso during 1997:

“[D]istrustful investors have wondered aloud whether the central bank—which lost much credibility with the collapse—really enjoys independence...[T]he doubters have noted that the government's policy on the peso, which is theoretically free to float, has actually been set by a committee...”

Calvo (1999b) has persuasively argued that, to the extent that there are poorly informed participants in the market for emerging market debt, the lack of transparency and credibility on the authorities will leave these countries open to speculation based on rumors and herd instinct. These, in turn, can easily result in major attacks on the currency.

Frankel and Schmukler (1999) have recently discussed the issue of exchange rate and monetary policy verifiability. According to them, under most circumstances it is difficult and costly for analysts – and even for very sophisticated ones – to actually verify whether a particular country is, in fact, following the policies that it has announced. This view is certainly supported by the work on Mexico discussed above; it took Edwards and Savastano (1998) a substantial amount of time and some detective-type work to unearth the Bank of Mexico reaction function. The above discussion does not mean that emerging countries should avoid complex feedback rules, or should abstain from floating. What it underscores, however, is the need to communicate to the public, in a transparent a

¹⁹ Naturally, as pointed out above, it is difficult to make general statements on the basis of one historical case. Nonetheless, Mexico's experience is very useful.

way as possible, the type of policy that is being followed (see Bernanke et al 1999 for a discussion of monetary authorities' communication strategies within the context of an inflation targeting context).

Fear to Float: Some analysts, most notably Calvo (1999b), and Calvo and Reinhart (1999), have argued that most emerging economies are affected by a “fear of floating.” As a result, they will intervene actively in the domestic financial market, generating a “rigid exchange- rate- cum-high-interest-rates” situation.

The IDB Chief Economist, Ricardo Hausmann, has expressed in a number of seminars that Mexico provides a premier example of the “fear of floating” syndrome.²⁰

According to him, in Mexico depreciations of the peso have been followed by hikes in interest rates, reflecting massive government intervention, and reflecting a “fear of floating.” This situation, Hausman has argued, contrasts with countries such as Australia where the currency has (recently) depreciated, while domestic interest rates have remained relatively stable.

Although, as pointed out above, Mexico has indeed adjusted its monetary policy in response to (some) exchange rate developments, there is little evidence suggesting that it has been subject to a significant “fear of floating.” Figure 8 presents weekly data on the peso/dollar nominal exchange rate, and on the nominal interest rate on 28 day government securities (CETES) between 1994 and October of 1999. Table 4, on the other hand, presents correlation coefficients between these two variables for different subperiods. As may be seen from this table, the alleged strong positive relationship between the peso/dollar exchange rate is confined to a rather short subperiod. In effect, between January, 1996 and October, 1997 – when Mexico, as well as the rest of Latin America were affected by the East Asian crisis – these two variables were negatively correlated. Between November, 1997 and May, 1998 Mexico looked a lot like Australia, as the peso depreciated significantly (an accumulated 15.4%) with stable interest rates. During this his period, which corresponds to the first five months in office of a new Central Bank governor, the correlation between the two variables was virtually zero.

²⁰ He recently made that point at the Puerto Vallarta (Mexico) Seminar of the Instituto Mexicano de Ejecutivos de Finanzas in November 1999, and at the NBER Interamerican Seminar on Economics, Buenos Aires December 2-4 1999.

After the Russian crisis of August 1998 and the subsequent dry-up of global liquidity the peso and Mexican domestic interest rates did, indeed, exhibit a positive correlation. At that time, and due to a severe attack on the currency, the Mexican authorities decided that this was a temporary situation and that allowing the peso to weaken further would compromise the inflation target. This type of reaction is indeed what a modern and forward-looking inflation targeting model would indicate (Bernanke et al 1999). Indeed, in an elegant recent paper Svensson (1999) has developed an inflation targeting framework that allows for this type of no-linear, threshold-triggered reaction and judgement-aided reaction to occur.

In retrospect, it is difficult to believe that, had Mexico had a super-fixed exchange rate regime, it would have been able to face the 1998 global liquidity squeeze more effectively. After all, during 1999 the economic recovery continued, inflation was on target, employment has grown at healthy rates, and interest rates have declined significantly. And, broadly speaking, the exchange rate has gone back to approximately its pre-crisis level. It should be emphasized, however, that Mexico's successful experience of the last few years does not mean that every country that floats will behave in this way. It does mean, however, that the "fear of floating" is not as pervasive as claimed. It does also mean that not every monetary policy feedback rule is detrimental to the country's well being. If implemented correctly, and are supported by the right type of fiscal policy, these rules can be very useful in improving macroeconomic management.

V. Exchange Rate Policies in Emerging Economies: A Proposal

The analysis in the preceding sections focused on three issues: (1) the recent evolution of exchange rates policy views; (2) the historical evidence on economic performance under alternative regimes; and (3) some of the most important historical experiences with super-fixed and floating exchange rate regimes in emerging markets. On the basis of the evidence reviewed in this paper, in this section I make specific proposals on emerging countries' exchange rate policy. I discuss both the role of the IMF, as well as specific requirements for the two alternative type of regimes to be successful.

A useful point of departure is to recognize that since the mid 1990s pegged-but-adjustable regimes -- which had been the staple of exchange rate policy in emerging

nations, since the 1950s --, began to lose rapidly credibility. This was for a series of reasons, including the fact that almost every country that attempted to implement a controlled devaluation during that fared quite badly.

Large capital flows were at the heart of every major currency crisis during the 1990s. From Mexico in 1994, to East Asia in 1997, to Russian in 1998 and Brazil in 1999, the stories are remarkably similar: Attracted by high domestic interest rates, a sense of stability stemming from rigid exchange rates, and what at the time appeared to be rosy prospects, large volumes of foreign funds – mostly in the form of portfolio capital – moved into these economies, propelling stock market booms and helping finance large current account deficits. At some point – and for a variety of reasons, including the realization (or perception) that policies were unsustainable -- these funds slowed down and/or were reversed. This change in conditions required significant corrections in macroeconomics policies. Invariably, however, the adjustment was delayed or was insufficient, increasing the level of uncertainty and the degree of country risk. As a result, increasingly large volumes of capital left the country, and international reserves dropped to dangerously low levels. Eventually the pegged exchange rate had to be abandoned, and the country was forced to float its currency. In some cases, such as Brazil and Russia, a runaway fiscal deficit made the situation even more explosive.

In a world with high capital mobility, even small adjustments in international portfolio allocations to the emerging economies result in very large swings in capital *flows*. Sudden reductions in these flows, in turn, amplify exchange rate adjustments and generate overshooting, further bruising credibility and unleashing a vicious circle. Crises, thus, tend to be deeper than in the past, imposing serious costs to the population of the countries involved.

Some analysts have argued that the imposition of capital controls – including controls on capital inflows – provides an effective way for reducing the probability of crises such as the one described above. The experience with capital controls, however, has been rather disappointing (Edwards 1999). It is exactly for this reason that an increasing number of analysts has argued that there is a need to introduce major changes to exchange rate practices in emerging economies, moving towards credible regimes, that

will reduce rumors-based reversals in capital flows – or what Dornbusch (1996) and Calvo (1999) have called “sudden stops.”

The following policy proposal would go a long way in increasing credibility, and thus reducing the probability of large and costly exchange rate crises:

A. The IMF and Exchange Rate Policies in Emerging Markets

1. The IMF should actively encourage countries to adopt either a floating system or a super fixed one.
2. The Fund should be strict in dealing with exchange rate regimes. This is because “moral hazard” is at the very center of exchange rate policies. Indeed, policy makers in the emerging nations are permanently tempted to adopt exchange rate policies that are (politically) beneficial in the short run, but highly costly in the longer run. Pegging the exchange rate at an artificial level, and in the presence of an inconsistent fiscal policy is, perhaps, the most common example of this type of practice.
3. More specifically, the IMF should impose an ex ante conditionality program regarding exchange rates. The idea is to put an end to the current practice, where by assisting countries in distress in a way that is largely independent of their pre-crisis behavior, the IMF tends to reward irresponsible behavior by emerging nations’ authorities.
4. Countries that adopt what the Fund (maybe in conjunction with a panel of experts) consider to be “*inconsistent and non-credible*” exchange rate regimes would only qualify for a very low – minimal indeed – level of assistance. Countries that follow (more) consistent and prudent set of policies would qualify for the next (or normal) level of assistance, in case they are affected by external shocks, including so-called contagion.
5. This type of system would change current IMF practices in a fundamental way. First, it would shift the emphasis from reacting to crises, to preventing

them.²¹ Second, as countries make an effort to pre-qualify for the high-assistance *tranche*, they would implement better macroeconomic policies and, thus, will be subject to fewer -- or at least less intense -- crises. And when a crisis actually hits, the IMF scarce resources would be channeled to those nations that have done their “homework.”

6. The actual implementation of this system would, of course, face some practical, as well as political, difficulties. In particular, there would be a need to define a set of criteria (or standards) to classify countries in the two assistance-tranches. In addressing this question, two fundamental issues have to be recognized. First, different countries face different realities and, thus, the classification system would have to have enough flexibility as to accommodate diverse country-specific circumstances. Second, and having made the previous point, recent history has clearly indicated that there are a large number of policies that, almost unavoidably, lead to disaster and crisis. This means that some practices – pegging the exchange rate without having a minimal level of international reserves, to mention just one -- should be clearly and strongly discouraged, by automatically classifying the country in the lowest tranche.
7. The implementation of this system could face political difficulties, since there is likely to be significant pressure to classify the “too-large-to-fail” countries in the highest assistance-level category, irrespective of their actual behavior. A more transparent and politically independent IMF would, hopefully, be able to withstand this type of pressure. More to the point, forming broad committees with outside experts, would help reduce the degree of political interference in determining which countries have not made it to the higher-assistance level.

21 The recently created Contingent Credit Line (CCL) represents a move in the direction of preventing crises. The problem, however, is that countries are generally reluctant to apply for this kind of contingent line. The notion is that, if they do, they are signaling weakness.

B. On the Selection of the Exchange Rate Regime

1. In principle, countries should be free to opt for either of these two type of arrangements. In some cases, however, and due to the country's specific characteristics, a certain regime will be strongly discouraged by the Fund. In fact, in the IMF should be prepared to classifying countries that opt for an inappropriate regime in the lower assistance tranche.
2. The transition from current practices to either super-fixed or floating regimes is crucial. Countries should work transitional programs with the Fund. These transitions should take a reasonable time. If they take longer, the country would only classify for the low level of assistance.
3. In opting for a regime it is crucial to remember that achieving credibility is of essence. This requires, at least, three elements:
 - Transparency;
 - Verifiability;
 - Consistency of policy package.
4. The IMF, thus, should insist that countries that wish to be classified in the higher assistance tranche provide some kind of verifiability method.
5. Mistakes are costly. In that regard, it is important to recognize that the costs of making a mistake – that is of opting for the “wrong” type of regime – are higher when the country has selected a super-fixed system. It is easier to move from floating to super-fixed, than the other way around.

C. On Floating Regimes

1. One of the greatest dangers of floating regimes is that market participants believe that the country is, in fact, pegging in disguise. In this case the credibility of the regime is low, and speculation will be substantial.
2. For the above reason countries that float should adopt a fairly clean float. Direct central bank intervention in the foreign exchange market should be strictly limited to extraordinary occasions. Moreover, in an effort to maintain transparency, the (broadly defined) rule governing direct intervention should be clearly announced.

3. A successful float – in the sense of providing a stable environment – requires of a consistent and well-defined framework for macroeconomics policy. As Svensson (1999) has argued, more than mechanical rules, what is needed is a “prescribed guide for monetary policy.” This, however, should *not* be taken as an excuse for discretion. In fact, the most difficult challenge in implementing a successful float is to combine a rich and complex “guide for monetary policy,” with the transparency requirement discussed above. Bernanke et al (1999, Ch. 3) discuss, quite extensively, the issue of communication policies within the context of inflation targeting.
4. The above means that floaters will, in general, incorporate exchange rate developments in defining their monetary policy. The nature of these considerations, as well as of the (complex) feedback mechanism should be made explicit. The Mexican reviewed in Section IV of this paper shows that a system such as this can work successfully in an emerging economy.
5. Needless to say, under floating – as under any regime – fiscal balance is of essence, as is a modern banking supervisory framework.
6. Floating does not mean that the country should not hold international reserves. On the contrary, in order for the announced monetary framework – including the (complex) feedback mechanism – to be credible, the monetary authority may have to hold a relatively large stock of international reserves. The actual amount will, of course, depend on the specific characteristics of the country in question.
7. Countries with a de facto (partially) dollarized economy are **not** good candidates for floating. This is particularly the case if a highly leveraged corporate sector is mostly indebted in foreign currency.
8. In countries with a high percentage of dollar-liabilities, the positive effect of exchange rate movements on relative prices are offset by their negative effect on corporate balance sheets. The net effect of large depreciations may, in fact, be devastating.

9. Indonesia represents a clear recent case of this phenomenon. It is not the only one, however. Chile, for instance, went through a very similar experience during the early 1980s.²²

D. On Super-fixed Regimes

1. A useful starting point is to recognize that, at least at this point in time, it is highly unlikely that (the vast majority of) emerging countries will be able to sign monetary treaties with the major currency areas (Dollar, Euro or Yen).
2. This means that, for all practical purposes, that countries that consider adopting a super-fix regime are limited to two options: currency boards or unilateral dollarization.
3. If dollarization is chosen, the country should be aware that it will lose the seignorage. In terms of present value this may be relatively high. Whether the country is actually willing to give this up should be part of the overall decision on which regime to adopt. Generally speaking, however, countries that according to technical criteria -- including those of optimal currency area analyses -- are candidates for dollarization should not weigh the loss of seignorage too heavily in making the final decision.
4. As the Argentine experience reviewed in this paper illustrates vividly, currency boards are not automatically credible, nor do they eliminate high and volatile interest rates.
5. To be credible, currency boards require to be supplemented with a very strict fiscal policy. This, in turn, needs to be supported by the right type of institutions, including constitutionally-mandated balance budgets, fiscal stabilization funds, and clear rules governing the financial relationship between the national and the sub-national governments.
6. As the experience of Panama discussed in this paper suggests, dollarization does not assure, on its own, that the fiscal accounts will be in order. It is unlikely that other countries will receive, in the future, the type of massive and continuous support that Panama has received from the IMF.

22 On Chile's interesting experience see Edwards and Edwards (1991, p 78-80)

7. The need to have a solid fiscal institutional arrangement is also valid for dollarized systems, should be emphasized again and again.
8. The lender of last resort function has to be addressed in an effective and credible way *before* the country adopts the super-fixed regime. This will require implementing the type of structure discussed above – a sizable contingent credit line, high liquidity requirements on banks, and massive (or, even better, dominant) presence of international banks in the domestic banking sector.
9. At the time a super-fixed regime is adopted it is important that the domestic currency is not overvalued or, in other words, that relative prices are not out of line. However, as discussed in this paper (especially in the appendix), existing methodologies for assessing overvaluation are not very powerful and, on occasion, have been misleading.
10. Countries that opt for a super-fixed regime should have a highly flexible labor market. Indeed, if labor legislation is restrictive and rigid, negative external shock will result in jumps in unemployment and severe contractions in economic activity. This will not only be costly for the country in question but will also affect the credibility of the regime.
11. Finally, it is important to recognize that, although reversing the decision to super-fix is difficult, it is **not** impossible. Two historical cases come to mind: Argentina did have a currency board early in the 20th century, and it abandoned it. Liberia was dollarized, and also abandoned that regime. In short, even under super-fixed regimes credibility problems will remain. There is no substitute for overall solid political and economic institutions.

APPENDIX: ASSESSING REAL EXCHANGE RATE OVERVALUATION

After the Mexican crisis of 1994, academic and private sector analysts redoubled their efforts to understand real exchange rate behavior in emerging economies. Assessing whether a country's RER is out of line with its long run equilibrium is not easy, however. In fact, attempts to construct misalignment indices have tended to be go from the simplistic to the controversial. The basic approach to misalignment is to use a simple version of purchasing power parity (PPP). This methodology, however, is subject to numerous (and well known) shortcomings, including the fact that it does not consider the effects of changes in fundamentals over the equilibrium real exchange rate. In this appendix I evaluate two "advanced" methods for evaluating real exchange rate overvaluation. I argue that, although they represent a major improvement over the PPP approach, they are still subject to serious limitations.

Most modern empirical approaches to assessing real exchange rate misalignment go beyond PPP, and based on small—usually single equation—econometric models. In these models the real exchange rate is defined as the relative price of tradable to nontradable goods that, simultaneously, is compatible with the attainment of internal and external equilibrium.²³

As a backdrop for those analyses many authors develop theoretical models (representative agent, intertemporal frameworks, with price flexibility, perfect competition and rational expectations have become the most popular ones), from which a reduced form for the equilibrium RER is derived.²⁴ This reduced form relates the long-run equilibrium real exchange rate to a set of variables, called the RER "fundamentals." These "fundamentals" usually include the terms of trade, output growth (or productivity differentials), the country's degree of openness to international trade, import tariffs and government spending. While some authors have tried to use a relatively large number of "fundamentals" in their regression equations, others have restricted their analyses to a small number of variables.

²³ A concept of the RER that, as noted earlier, has its theoretical foundation in the "dependent economy model."

²⁴ On theoretical models of RER behavior see, for example, Edwards, (1989) and Obstfeld and Rogoff, (1996). On the derivation of reduced forms to derive the long run equilibrium real exchange rate see Hinkle and Montiel, (1997).

In this framework the RER is said to be “misaligned” if its actual value exhibits a (sustained) departure from its long run equilibrium. This situation can arise, for example, when there are changes in fundamentals that trigger a change in the equilibrium RER, but that are not reflected in changes in the actual RER. A different type of misalignment takes place when macroeconomic policies become incompatible with maintaining internal and external equilibrium, and give rise to a sustained appreciation of the actual RER.²⁵ From a theoretical standpoint, the concept of misalignment requires assuming that there exist institutional or other type of rigidities that prevent the RER from adjusting rapidly towards its medium- to long-run equilibrium level.²⁶ The majority of single equation models follow a four-step approach for assessing RER misalignment.²⁷ In the first step, historical data are used to estimate a (reduced form) RER equation.²⁸

$$(1) \quad \text{RER}_t = \sum a_i x_{it} + \varepsilon_t ,$$

where the x_{it} 's are the “fundamentals”, the a_i 's are their corresponding regression coefficients, and ε_t is an error term. Most recent studies that estimate equations like (1) have done so using cointegration techniques.

The second step usually (but not always) consists of computing “normal” or “sustainable” values for the fundamentals. This is typically done by decomposing the x_{it} 's into “permanent” and “transitory” components using various techniques, including the methodology suggested by Beveridge and Nelson.

$$(2) \quad x_{it} = x_{p\ it} + x_{t\ it} ,$$

where $x_{p\ it}$ and $x_{t\ it}$ are the permanent and transitory components of fundamental i in period t . Baffes, Elbadawi and O'Connell, (1997) have argued that because deficiencies in the data of many developing countries make it problematic to apply the Beveridge-

25 See Edwards, 1989, and Hinkle and Montiel, 1997.

26 Most authors, however, either ignore or do not specify clearly the source of these rigidities. See the discussion below.

27 This methodology was applied in Edwards (1988). In a related discussion Baffes, Elbadawi and O'Connell, (1997) identify three steps in the single equation methodology.

28 We have chosen a linear functional form for equation (1) for expositional purposes. Naturally, this needs not be the case. Baffes et al., (1997) also consider a linear representation of the equilibrium RER in their analysis.

Nelson decomposition, analysts should rely on alternative procedures, including *ex-ante* (that is, judgment-based) estimates of the sustainable level of the “fundamentals”.

The third step consists of using the x_{it} 's—which are interpreted as the long-run sustainable values of the fundamentals, and the estimated regression coefficients $\hat{\alpha}_i$ to construct an “equilibrium” path for the RER.

$$(3) \quad RER^*_t = \sum \hat{\alpha}_i x_{it}.$$

An important property of equation (3) is that, in contrast with simple PPP-based calculations, it generates an estimated equilibrium RER that does not have to be constant over time. Indeed, to the extent that there are changes in fundamentals, the estimated index of the equilibrium RER obtained from equation (3) will vary through time.²⁹ In the fourth, and final, step the degree of misalignment is computed as the difference, at any moment in time, between the equilibrium and the actual (or observed) RER.

$$(4) \quad MIS = RER^*_t - RER_t.$$

If $RER^*_t > RER_t$, the model would suggest that the currency is *overvalued*; conversely, if $RER^*_t < RER_t$, the model would indicate that the domestic currency is *undervalued*.

An analysis based on this methodology has been recently implemented by Goldman-Sachs (1997). The first version of this model, released in October of 1996 – almost eight months before the eruption of the East Asian crisis --, indicated that the real exchange rate was overvalued in Indonesia, the Philippines and Thailand. Subsequent releases of the model incorporated additional countries, and suggested that the Korean won and the Malaysian ringgit were also (slightly) overvalued. In mid 1997, Goldman-Sachs introduced a new refined version of its model; according to these new estimates, in June of 1997 the currencies of Indonesia, Korea, Malaysia, the Philippines, and Thailand were overvalued, as were the currencies of Hong Kong and Singapore. In contrast, these calculations suggested that the Taiwanese dollar was undervalued by approximately 7 percent. Although according to G-S, in June 1997 the degree of overvaluation was rather modest in all five East Asian-crisis countries, it had been persistent for a number of years: in Indonesia the real exchange rate had been overvalued since 1993, in Korea in 1988, in

²⁹ As is argued below, however, computations based either on the single equation approach (equation (3)) or on some version of PPP require defining a within-sample benchmark for the equilibrium RER.

Malaysia in 1993, in the Philippines in 1992, and in Thailand since 1990 (See Edwards and Savastano 1999 for a review of other applications of this model to assessing real exchange rate overvaluation).

Although the methodology described here represents a major improvement over simple PPP-based calculations, it is still subject to a number of limitations. The most important one is that, as is the case in all residuals-based models, it assumes that the real exchange rate is, on average, in equilibrium during the period under study. This, of course, needs not be the case. Second, this approach ignores the role of debt accumulation, and of current account dynamics. Third, the more simple applications of this model ignore the major jumps in the real exchange rate, following a nominal devaluation. This, in turn, will tend to badly bias the results, and will tend to generate misleading predictions. A fourth shortcoming of these models is that they do not specify a direct relationship between the estimated RER* and measures of internal equilibrium, including the level of unemployment.

An alternative approach, sometimes associated with the IMF, consists of calculating the “sustainable” current account deficit, as a prior step to calculating the equilibrium real exchange rate. This model relies on (rather simple) general equilibrium simulations, and usually does not use econometric estimates of a real exchange rate equation. Clark and MacDonald, (1998) have recently characterized the basic IMF model for assessing real exchange rate overvaluation by the following set of equations:

$$(5) \quad CA = -KA,$$

$$(6) \quad CA = b_0 + b_1 q + b_2 y_d + b_3 y_f = -KA^*$$

$$(7) \quad FEER = (-KA^* - b_0 - b_2 y_d - b_3 y_f) / b_1,$$

Where CA is the current account; KA* is the *exogenously given* equilibrium capital account, or sustainable inflow of capital into the country in question; q is the real exchange rate; and y_d and y_f are domestic and foreign aggregate demand levels compatible with full employment (or internal equilibrium). Equation (7) determines the equilibrium RER as a function of the exogenous capital account and of domestic and

foreign aggregate demands. In this setting the more traditional “fundamentals”, such as terms of trade, government spending and import tariffs, play a role only to the extent that they affect KA^* , y_d or y_f .

Although the model represented by equations (5)-(7) is a highly simplified version of the general equilibrium simulation approach, it does capture some important features of most efforts in that tradition. An inspection of equations (4) through (7) clearly suggests that this methodology is also subject to some serious problems. First, the sustainable level of the capital account is determined exogenously. In most practical applications the researcher chooses a value for K^* on the basis of historical evidence. This means that, as in the case of the single equation models, many simulation models require defining some type of “base period” (year) linked to the country’s past experience. And second, most simulation models are largely based on flow considerations, and say little about the stock demand for net foreign assets, or the evolution of capital flows over time.

In sum, while one of the most important lessons of the recent currency crisis is the need for avoiding real exchanger rate misalignment, and especially real exchange rate overvaluation, existing models for assessing the appropriateness of a country’s real exchange rate suffer from some important limitations. In that regard, improving on these models clearly represents a research priority, both for academics as well as for analysts in the private and public sector.

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Table 1. Alternative Exchange Rate Regimes

Regime	Main Features	Main Benefits	Main Shortcomings	Key episodes /Comments
1. Free Float	-Value of foreign exchange freely determined in the market. Actual and expected changes in demand/supply of assets and goods reflected in exchange rate changes.	-Changes in nominal exchange rate shoulder bulk of adjustment to foreign and domestic shocks. -High international reserves not required.	-High nominal (and real) exchange rate volatility may distort resource allocation. -Monetary policy needs to be framed in terms of nominal anchors different from the exchange rate; scope for discretion and inflation bias may be large.	-Virtually no country has a pure float. The United States, Germany, Switzerland (and Japan, according to some) come close.
2. Floating with a “feedback rule”	- Indirect intervention (through changes in interest rates, liquidity and other financial instruments) does not result in changes in reserves.	-Same as in a free float, except that higher international reserves may be needed. - Dampens “excessive” fluctuations of exchange rates.	-Lack of transparency of central bank behavior may introduce too much uncertainty. -Effects of intervention may not last and may be destabilizing.	-Many advanced economies have adopted this regime—Canada, Australia (Japan, according to others) . - Mexico adopted a system similar to this following the 1994-95 crisis.
3. “Dirty” or Managed Float	-Sporadic central bank interventions in foreign exchange market. Modes and frequency of intervention vary, as do the objectives guiding the intervention . -Active intervention (sterilized and non-sterilized) results in changes in international reserves.	-Same as in a free float, except that higher international reserves may be needed. - Dampens “excessive” fluctuations of exchange rates.	-Lack of transparency of central bank behavior may introduce too much uncertainty. -Effects of intervention are typically short-lived (even when intended as a signal) and may be destabilizing.	-A dirty float could be thought of as a managed float with wide bands, with the (undisclosed) position of the bands providing the criterion for intervention.
4. Floating within a Band (Target zone)	-The nominal exchange rate is allowed to fluctuate (somewhat freely) within a band. The center of the band is a <i>fixed rate</i> , either in terms of one currency or of a basket of currencies. The width of the band varies (in the ERM it was originally ± 2.25 percent). - Some band systems are the result of cooperative arrangements, others are unilateral.	-System combines the benefits of some flexibility with some credibility. -Key parameters (bands, mid-point) help guide the public’s expectations. - Changes in the nominal rate within the bands help absorb shocks to fundamentals.	-In some cases (especially when the band is too narrow and when domestic macro policies are not consistent with a “horizontal” band) the system can be destabilizing and prone to speculative attacks. -Selecting the width of the band is not trivial. -Systems that allow for the possibility of realignment of the bands and central parity weaken the credibility afforded by the regime.	-The Exchange Rate Mechanism of the European Monetary System is the best known example of this type of regime. - The ERM crises of 1992-93 showed clearly that the system can be subjected to severe speculative pressures, and even collapse, when currencies become misaligned and central banks are hesitant to defend the bands.

5. Sliding Band	<p>-There is no commitment by the authorities to maintain the central parity “indefinitely”. Instead, it is clear at the outset that the central parity will be adjusted periodically (e.g., due to competitiveness considerations).</p> <p>-The system is an adaptation of the band regime to the case of high-inflation economies.</p>	<p>-The system allows countries with an ongoing rate of inflation higher than world inflation to adopt a band without having to experience a severe real appreciation.</p>	<p>-The fact that the timing and size of central parity adjustments are unknown, introduces considerable uncertainty, which often leads to high interest rate volatility.</p> <p>-As in the case of the standard band system, it is difficult to choose the appropriate width for the band.</p>	<p>-Israel had a system similar to this from early 1989 to December 1991.</p> <p>-The uncertainty and volatility associated with this system makes it less attractive than other alternatives, such as the crawling band.</p>
6. Crawling Band	<p>-A band system whereby the central parity crawls over time.</p> <p>-Different rules can be used to determine the rate of crawl. The two most common are: backward-looking crawl (e.g., based on past inflation differentials), and forward-looking crawl (e.g., based on the expected, or target, rate of inflation).</p>	<p>-System allows high inflation countries to adopt a band system without having to undertake (large) stepwise adjustments of the central parity.</p>	<p>-Choosing the criteria for setting the rate of crawl entails serious risks. A backward-looking approach can introduce considerable inflationary inertia into the system. A forward-looking approach that sets the “wrong” inflation target can produce overvaluation and give rise to speculative pressures.</p>	<p>-Israel adopted this system in December 1991. Chile had a widening band system from 1986 to mid-1998. Italy also had, effectively, a system of this type between 1979 and 1991.</p>

Table 1 (Concluded). Alternative Exchange Rate Regimes

Regime	Main Features	Main Benefits	Main Shortcomings	Key Episodes/Comments
7. Crawling peg	<p>-The nominal exchange rate is adjusted periodically according to a set of indicators (usually lagged inflation differentials) and is not allowed to fluctuate beyond a narrow range (say, two percent).</p> <p>-One variant of the system consists of adjusting the nominal rate by a pre-announced rate set deliberately below ongoing inflation (variant known as a “tablita” regime).</p>	<p>-Allows high-inflation countries to avoid severe real exchange rate overvaluation.</p> <p>-The “tablita” variant helps to guide the public’s expectations, and buys a limited amount of credibility.</p>	<p>-A pure backward-looking crawling peg (where the nominal rate is mechanically adjusted according to past inflation differentials) introduces inflationary inertia and may eventually cause monetary policy to lose its role as nominal anchor.</p> <p>-Equilibrium changes in the real exchange rate are difficult to accommodate.</p> <p>-A “tablita” system will not last if fiscal and incomes policies are not supportive.</p>	<p>-This system became popular in the 1960s and 1970s in Chile, Colombia and Brazil. It had its longer running in Colombia, which to this date has a high degree of inflationary inertia.</p>
8. Fixed-but-	<p>-The regime epitomized by the Bretton</p>	<p>-Provides macroeconomic</p>	<p>-Realignments (devaluations) under</p>	<p>-The most popular regime of this</p>

adjustable exchange rate	Woods system. The nominal exchange rate is fixed, but the central bank is not obliged to maintain the parity indefinitely. No tight constraints are imposed on the monetary and fiscal authorities, who can follow, if they so decide, policies that are inconsistent with preserving the parity. - Adjustments of the parity (devaluations) are a powerful policy instrument.	discipline by maintaining (tradable good prices) in line with foreign prices in a context of relatively low uncertainty -The built-in “escape clause” (which allows the authorities to devalue in case of need) provides the system with some flexibility.	this system have typically been large and disruptive (introducing uncertainty and inflationary pressures) rather than smooth and orderly events. -If supplemented by the right institutions (e.g., an independent central bank) the time inconsistency problems embedded in the system could be attenuated.	century. Most developing countries held on to (variants of) it after the formal collapse of the Bretton Woods agreement in 1973. -Many emerging countries continue to subscribe to this system de facto (e.g., Mexico 1993-93, Thailand, 1997), if not de jure.
9. Currency board	-Strict fixed exchange rate system, with institutional (legal, and even constitutional) constraints on monetary policy and no scope for altering the parity. - The monetary authority only can issue domestic money when it is fully backed by inflows of foreign exchange.	-The system maximizes credibility and reduces (eliminates) problems of “time inconsistency” .	- The system is long on credibility but short on flexibility. Large external shocks cannot be accommodated through exchange rate changes but have to be fully absorbed by changes in unemployment and economic activity. - The central bank loses its role as lender of last resort.	-Historically, a number of small countries have had systems of this type. Some of them, however, have not been successful. When faced with major external shocks, countries have been forced to abandon the regime. -Currently, Hong Kong and Estonia have currency boards. Argentina and Bulgaria have (quasi)-currency boards arrangements.
10. Full ‘dollarization’	-Generic name given to an extreme form of a currency board system where the country gives up completely its monetary autonomy by adopting another country’s currency.	-Credibility is maximized under this regime. Monetary authorities have, in theory, no scope for “surprising” the public.	-As in the currency board, the system is long on credibility but short on flexibility. Adverse external shocks have to be absorbed fully by the real economy. -The central bank loses its role as lender of last resort. -A non trivial shortcoming of this system is that it is usually resisted on political and nationalistic grounds. Another one, is that the rules of the game can be changed under extreme circumstances.	There are few historical episodes of full dollarization. A regime similar to this has worked relatively well in Panama. However, the case of Liberia unmasked a serious shortcoming of this type of system: when faced with an emergency (civil war) politicians decided to change the rules of the game and issued a national currency.

Table 2: Comparative Exchange Rate Volatility

Daily Exchange Rates	Australia	Canada	France	Germany	Japan	New Zealand	Mexico	UK
1991								
No of Obs	260	260	260	260	260	260	na	260
Mean Absolute % Change	0.278	0.135	0.575	0.623	0.442	0.286	na	0.532
Std Dev of % Change	0.274	0.131	0.534	0.577	0.407	0.303	na	0.516
Max absolute % Change	2.078	0.842	2.720	3.144	2.780	2.005	na	3.058
# of Obs with Zero Change	19	17	13	12	13	23	na	17
1992								
No of Obs	262	262	262	262	262	262	260	262
Mean Absolute % Change	0.306	0.225	0.686	0.639	0.399	0.268	0.109	0.601
Std Dev of % Change	0.298	0.208	0.677	0.560	0.389	0.279	0.141	0.590
Max absolute % Change	1.646	1.471	4.046	2.668	2.988	1.734	1.092	3.081
# of Obs with Zero Change	13	14	10	9	11	39	26	13
1993								
No of Obs	261	261	261	261	261	261	261	261
Mean Absolute % Change	0.445	0.248	0.498	0.514	0.486	0.308	0.132	0.543
Std Dev of % Change	0.380	0.204	0.432	0.436	0.472	0.327	0.316	0.494
Max absolute % Change	1.801	1.070	2.320	2.329	2.871	2.492	4.012	2.746
# of Obs with Zero Change	16	14	12	14	11	21	34	21
1994								
No of Obs	261	261	261	261	261	261	261	261
Mean Absolute % Change	0.324	0.196	0.400	0.416	0.419	0.248	0.444	0.299
Std Dev of % Change	0.293	0.169	0.359	0.374	0.400	0.238	1.977	0.289
Max absolute % Change	1.600	0.905	2.512	2.416	3.353	1.312	19.356	1.762
# of Obs with Zero Change	25	12	9	9	12	29	35	12
1995								
No of Obs	261	261	261	261	261	261	261	261
Mean Absolute % Change	0.350	0.235	0.466	0.541	0.595	0.292	1.063	0.346
Std Dev of % Change	0.354	0.243	0.488	0.532	0.622	0.248	1.755	0.362
Max absolute % Change	1.921	1.674	2.893	3.003	3.328	1.254	10.465	1.975
# of Obs with Zero Change	30	17	10	10	11	21	60	16

Change

1996								
No of Obs	262	262	262	262	262	262	262	262
Mean Absolute % Change	0.273	0.133	0.276	0.299	0.345	0.280	0.231	0.253
Std Dev of % Change	0.292	0.120	0.252	0.279	0.351	0.264	0.227	0.293
Max absolute % Change	2.664	0.645	2.012	2.142	2.235	1.414	1.221	2.539
# of Obs with Zero Change	30	18	9	12	13	15	35	18
1997								
No of Obs	261	261	261	261	261	261	261	261
Mean Absolute % Change	0.428	0.190	0.457	0.469	0.523	0.357	0.282	0.380
Std Dev of % Change	0.391	0.167	0.381	0.379	0.511	0.351	0.522	0.353
Max absolute % Change	3.066	1.052	1.872	1.957	2.868	2.324	6.984	2.151
# of Obs with Zero Change	26	16	8	8	11	14	22	11
1998								
No of Obs	261	261	261	261	261	261	261	261
Mean Absolute % Change	0.608	0.294	0.413	0.410	0.792	0.673	0.569	0.328
Std Dev of % Change	0.597	0.295	0.367	0.365	0.797	0.643	0.778	0.278
Max absolute % Change	4.479	2.096	1.926	1.932	5.495	3.939	4.950	1.718
# of Obs with Zero Change	15	14	8	11	8	12	25	9
1999(~Dec 20)								
No of Obs	252	252	252	252	252	252	252	252
Mean Absolute % Change	0.439	0.267	0.422	0.422	0.602	0.510	0.356	0.328
Std Dev of % Change	0.360	0.228	0.372	0.374	0.551	0.457	0.450	0.275
Max absolute % Change	1.714	1.382	2.349	2.389	3.118	3.078	3.792	1.452
# of Obs with Zero Change	21	9	13	13	7	12	28	10

Source: Constructed from data obtained from Datastream

Table 3: Comparative Exchange Rate Volatility

Weekly Exchange Rates	Australia	Canada	France	Germany	Japan	New Zealand	Mexico	UK
1991								
No of Obs	51	51	51	51	51	51	NA	51
Mean Absolute % Change	0.654	0.320	1.348	1.398	0.866	0.678	NA	1.257
Std Dev of % Change	0.564	0.253	0.953	0.988	0.856	0.617	NA	0.871
Max absolute % Change	3.118	1.166	3.519	3.759	3.638	2.708	NA	3.482
# of Obs with Zero Change	0	0	0	0	1	2	0	0
1992								
No of Obs	52	52	52	52	52	52	51	52
Mean Absolute % Change	0.669	0.583	1.726	1.573	0.938	0.530	0.296	1.539
Std Dev of % Change	0.684	0.444	1.367	1.164	0.830	0.544	0.296	1.497
Max absolute % Change	3.335	2.158	6.248	4.741	3.393	3.194	1.051	9.906
# of Obs with Zero Change	0	0	0	0	1	1	1	1
1993								
No of Obs	53	53	53	53	53	53	53	53
Mean Absolute % Change	0.911	0.543	1.183	1.244	1.112	0.631	0.302	1.372
Std Dev of % Change	0.686	0.538	0.829	0.937	0.770	0.567	0.597	0.995
Max absolute % Change	2.856	2.203	3.530	3.830	3.037	3.379	3.631	3.897
# of Obs with Zero Change	0	2	0	0	0	0	0	1
1994								
No of Obs	52	52	52	52	52	52	52	52
Mean Absolute % Change	0.621	0.460	0.924	0.987	0.951	0.584	1.144	0.715
Std Dev of % Change	0.531	0.293	0.706	0.754	0.776	0.400	4.645	0.552
Max absolute % Change	3.155	1.272	2.903	3.212	3.325	1.765	33.670	2.093
# of Obs with Zero Change	0	0	0	0	2	3	2	0
1995								
No of Obs	52	52	52	52	52	52	52	52
Mean Absolute % Change	0.869	0.539	1.089	1.219	1.438	0.595	2.441	0.743
Std Dev of % Change	0.636	0.414	1.053	1.219	1.304	0.464	3.041	0.668
Max absolute % Change	3.443	1.653	4.910	5.197	4.660	2.140	17.721	2.284
# of Obs with Zero Change	1	1	0	0	0	0	1	0

1996								
No of Obs	52	52	52	52	52	52	52	52
Mean Absolute % Change	0.632	0.310	0.681	0.697	0.733	0.584	0.548	0.685
Std Dev of % Change	0.602	0.240	0.607	0.650	0.587	0.440	0.500	0.610
Max absolute % Change	2.745	1.267	2.449	2.768	2.285	1.974	2.428	2.643
# of Obs with Zero Change	4	0	0	0	0	0	0	1
1997								
No of Obs	52	52	52	52	52	52	52	52
Mean Absolute % Change	0.902	0.518	0.902	0.902	1.186	0.744	0.624	0.806
Std Dev of % Change	0.702	0.376	0.694	0.707	1.088	0.732	0.937	0.722
Max absolute % Change	4.028	1.882	3.112	3.030	5.049	2.865	6.331	3.020
# of Obs with Zero Change	0	0	0	0	1	0	2	1
1998								
No of Obs	52	52	52	52	52	52	52	52
Mean Absolute % Change	1.614	0.685	1.073	1.064	2.122	1.460	1.328	0.826
Std Dev of % Change	1.258	0.628	0.694	0.688	2.328	1.300	1.466	0.641
Max absolute % Change	5.826	2.818	2.880	2.801	14.908	5.587	7.576	2.614
# of Obs with Zero Change	1	0	0	0	0	1	0	0
1999(~Dec 17)								
No of Obs	51	51	51	51	51	51	51	51
Mean Absolute % Change	1.015	0.553	1.119	1.118	1.598	1.103	0.828	0.768
Std Dev of % Change	0.756	0.465	0.689	0.697	1.191	0.864	0.820	0.523
Max absolute % Change	3.210	1.704	2.859	2.880	5.620	3.787	3.637	2.612
# of Obs with Zero Change	0	1	0	1	0	2	0	0

Source: Constructed from data obtained from Datastream

Table 4:

**Correlation Coefficients Between Mexico's
Exchange Rate and Nominal Interest Rate:
Weekly Data, 1996-1999**

Period	Correlation Coefficient
January 1996 - October 1997	-0.60
<i>November 1997 - May 1998</i>	0.04
<i>June 1998 - April 1999</i>	0.83
May 1999 - October 1999	0.08
<i>January 1996 - October 1999</i>	0.08

Source: Computed by the author using data from the Datastream datase

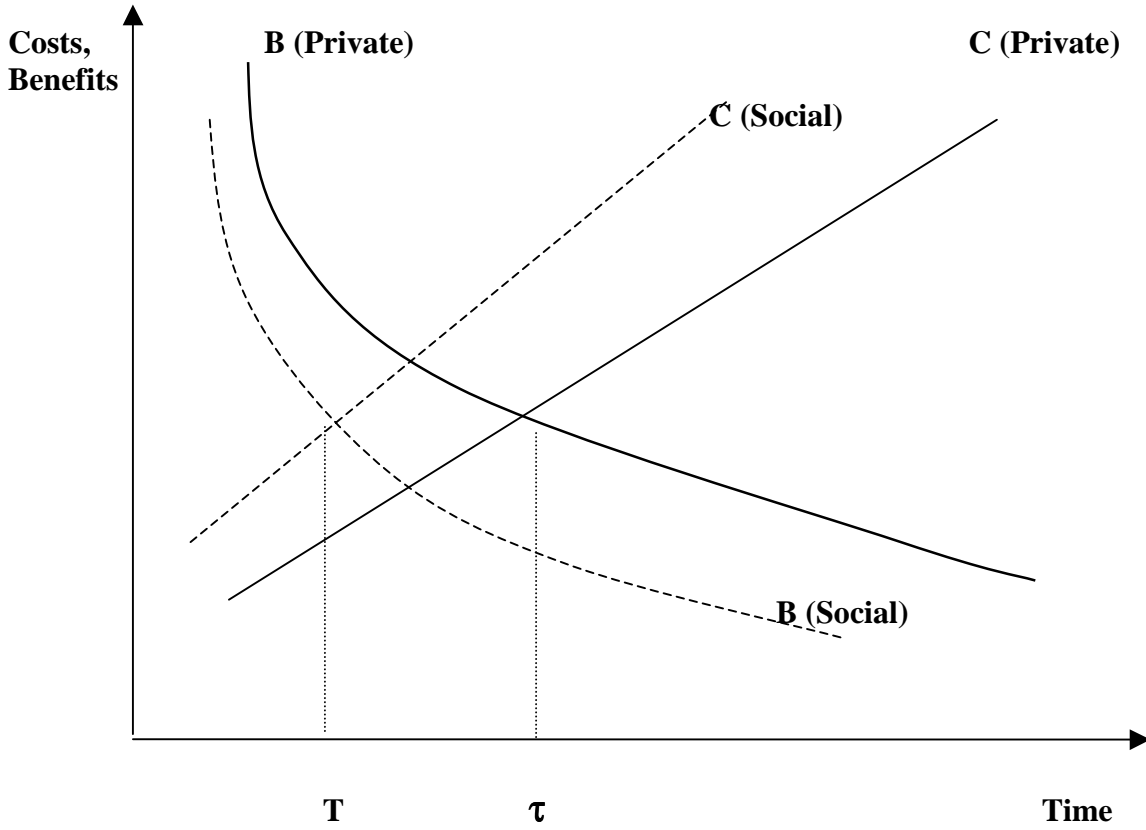
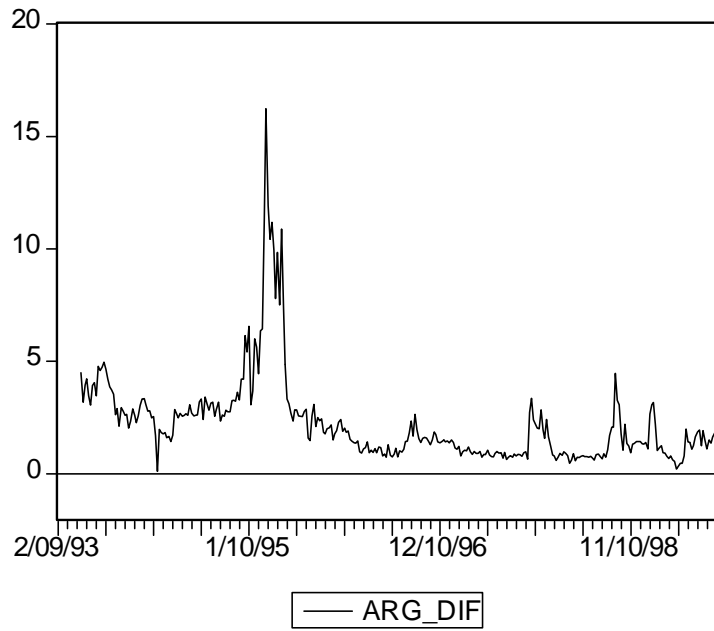


Figure 1: Optimal Exit: Private and Social Optimal Timing



**Figure 2: Argentina, Interest Rate Differential between
Peso and Dollar Denominated Deposits
(Weekly Data 1993-1999)**

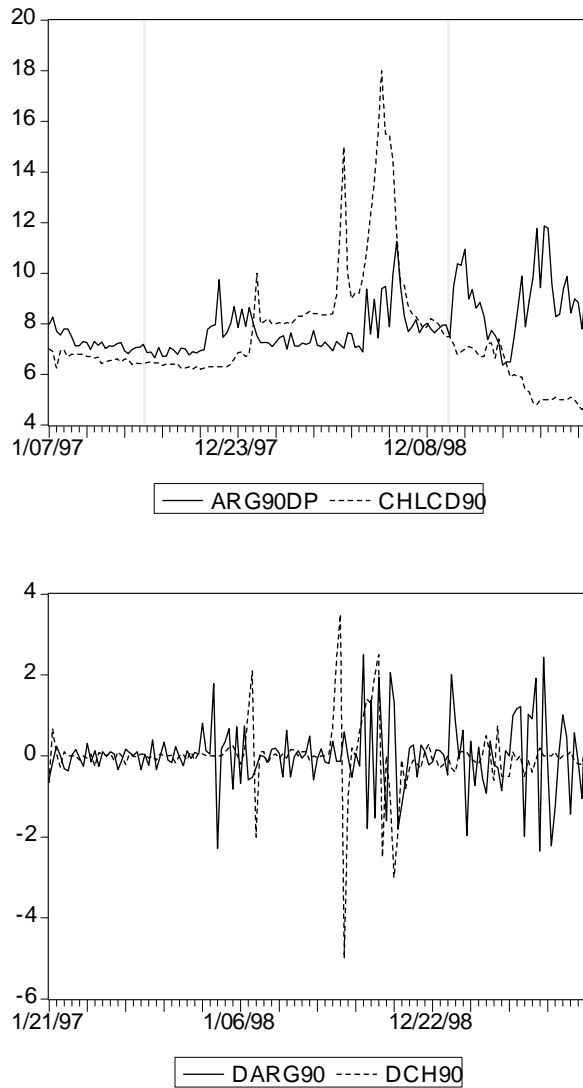
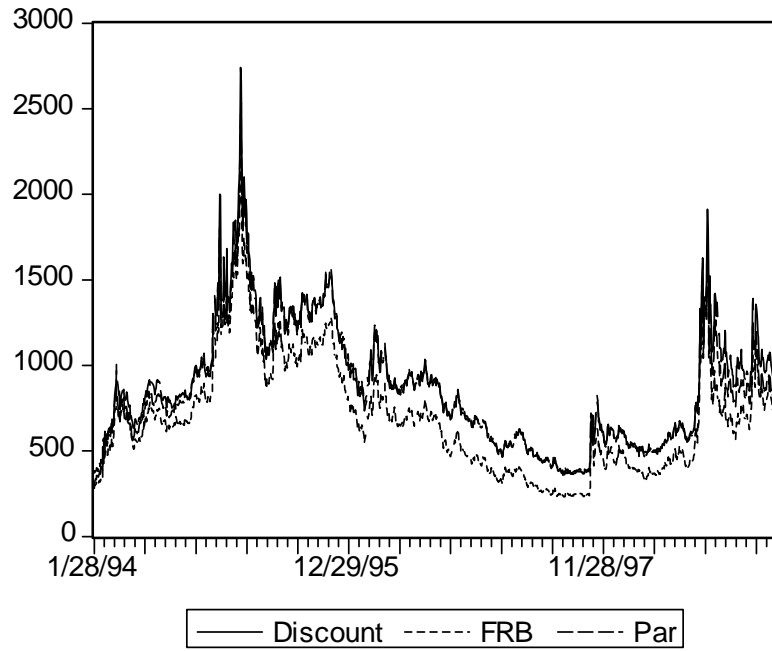


Figure 3: Interest Rates in Argentina and Chile

Upper Panel: Real Interest Rates (90 days deposits in domestic currency)
Lower Panel: First Differences of Real Interest Rates (90 days deposits in domestic currency)



**Figure 4: Argentina Brady Bonds:
Spreads over U.S. Treasuries (Daily Data, 1994-1999)**

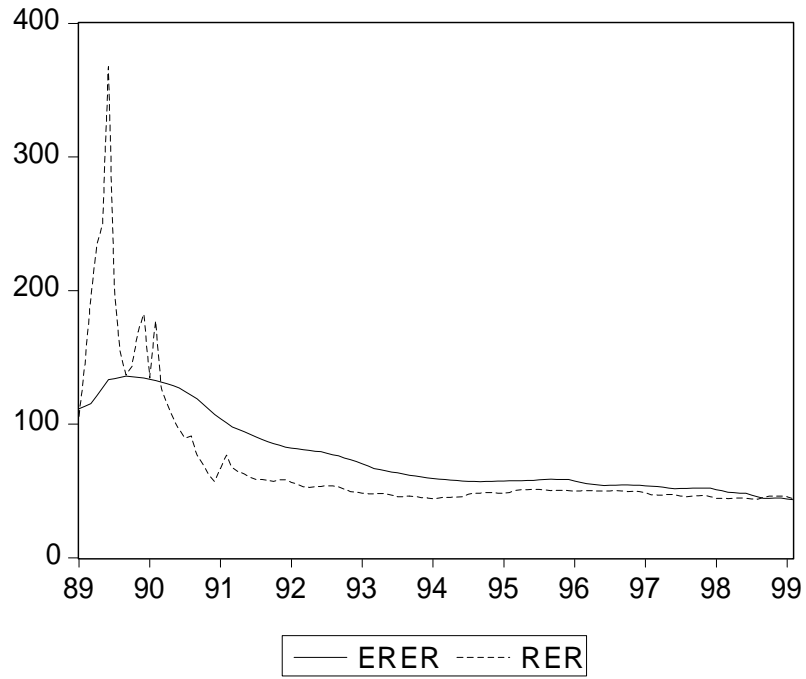
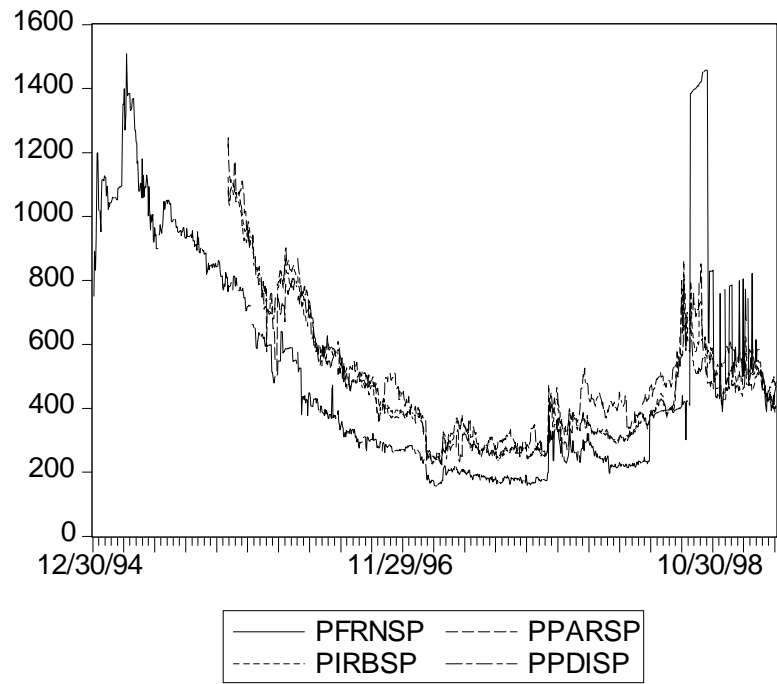


Figure 5: Argentina: Equilibrium and Actual Trade Weighted Real Exchange Rates, 1985-99 (Goldman-Sachs Estimates)



**Figure 6: Panama Brady Bonds Spreads
(Daily Data, December 1994-May 1999)**

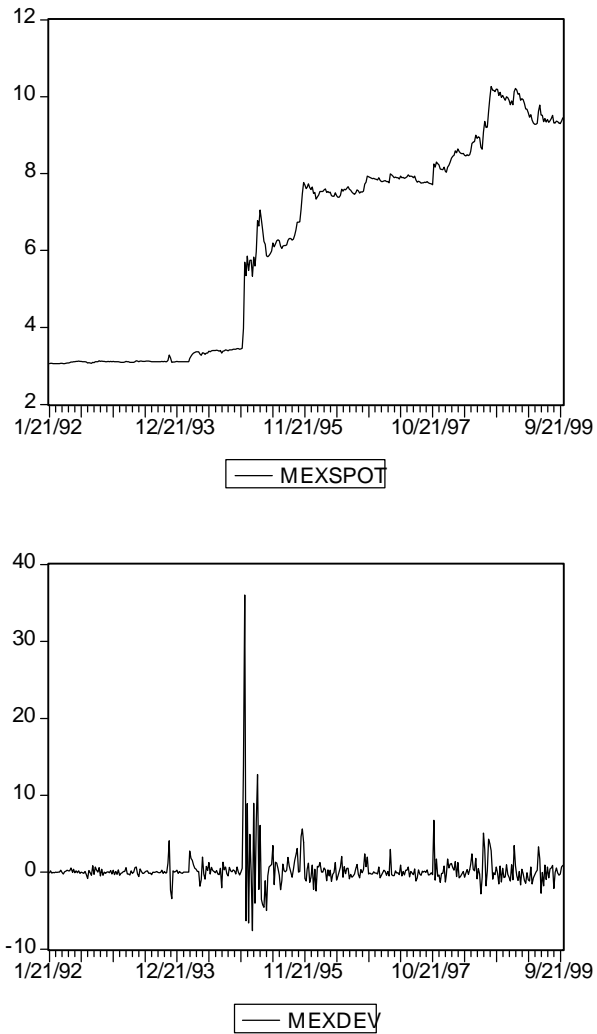
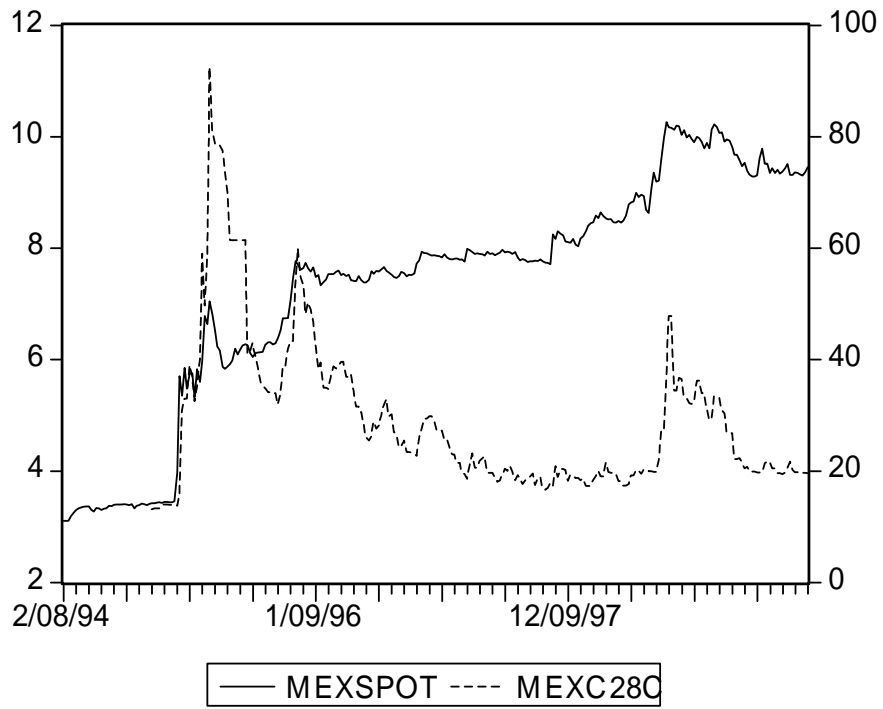


Figure 7: Mexican Peso-U.S. Dollar Exchange Rate.
Upper Panel: Spot Exchange Rate
Lower Panel: Rate of Depreciation of the Peso
(Weekly Data, January 1992-October 1999)



**Figure 8: Mexico Exchange Rate and 28-day
Nominal Interest Rate (Cetes)
(Weekly Data 1994-1999)**