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FEAR OF FLOATING*

GUILLERMO A. CALVO AND CARMEN M. REINHART

Many emerging market countries have suffered financial crises. One view blames soft pegs for these crises. Adherents of this view suggest that countries move to corner solutions—hard pegs or floating exchange rates. We analyze the behavior of exchange rates, reserves, and interest rates to assess whether there is evidence that country practice is moving toward corner solutions. We focus on whether countries that claim they are floating are indeed doing so. We find that countries that say they allow their exchange rate to float mostly do not—there seems to be an epidemic case of "fear of floating."

I. INTRODUCTION

After the Asian financial crisis and the subsequent crises in Russia, Brazil, and Turkey, many observers have suggested that intermediate exchange rate regimes are vanishing and that countries around the world are being driven toward corner solutions. The bipolar solutions are either hard pegs—such as currency boards, dollarization, or currency unions—or freely floating exchange rate regimes.[1] On the surface, at least, this statement accords with recent trends. Twelve countries in Europe chose to

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1. For recent interesting discussions of the corner solution hypothesis, see Frankel, Schmukler, and Servén [2001] and Fischer [2001]. Obstfeld and Rogoff [1995], who stress the increased difficulty of maintaining a peg in the face of rising capital mobility, also anticipate many of these issues.

give up their national currencies, while Ecuador was the first of what may be several countries in Latin America to adopt the United States dollar as its official national tender. More recently, El Salvador has also moved in that direction. At the other end of the spectrum, South Korea, Thailand, Brazil, Russia, Chile, Colombia, Poland, and, more recently, Turkey have announced their intentions to allow their currencies to float. Hence, on the basis of labels, at least, it would appear that currency arrangements are increasingly bipolar.

In this paper we investigate whether countries are, indeed, moving as far to the corners as official labels suggest. Since verifying the existence of a hard peg is trivial, our focus is on the other end of the flexibility spectrum. Specifically, we examine whether countries that claim they are floating their currency are, indeed, doing so. We analyze the behavior of exchange rates, foreign exchange reserves, and interest rates across the spectrum of exchange rate arrangements to assess whether the official labels provide an adequate representation of actual country practice. The data span monthly observations for 39 countries during the January 1970–November 1999 period. One-hundred-and-fifty-five exchange rate arrangements are covered in this sample.

The paper proceeds as follows. In Section II we provide descriptive statistics for exchange rates, foreign exchange reserves, and money market interest rates. We then compare the behavior of these variables across different exchange rate arrangements. In Section III we present a simple model that replicates several of the key stylized facts in these data; this framework explains why a country might prefer a smooth exchange rate as a result of the combined roles of inflation targeting and low credibility. In Section IV we introduce an exchange rate flexibility index motivated by the model. This index is meant to provide a multivariate summary measure of the degree of exchange rate flexibility in each episode—hence, it enables us to compare each episode with the benchmark of some of the more committed floaters to see whether the actual country practices match official labels. The concluding section touches on some of the implications of our findings.

II. Fear of Floating: The Stylized Evidence

Our data are monthly and span January 1970–November 1999. Thirty-nine countries in Africa, Asia, Europe, and the Western Hemisphere constitute our sample. The countries are Argentina, Australia, Bolivia, Brazil, Bulgaria, Canada, Chile, Colombia, Cote D'Ivoire, Egypt, Estonia, France, Germany, Greece, India, Indonesia, Israel, Japan, Kenya, Korea, Lithuania, Malaysia, Mexico, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Singapore, South Africa, Spain, Sweden, Thailand, Turkey, Uganda, Uruguay, the United States, and Venezuela. One-hundred-and-fifty-five exchange rate arrangements are covered in this sample. Our analysis, however, does not give equal attention to all regimes. In the earlier part of the sample, there were pervasive capital controls that make these episodes less relevant for the purposes of comparison to the present environment of high capital mobility. Also, a few of the floating exchange rate episodes occur during hyperinflations, which also complicate comparisons. Our choice of countries was, in part, constrained by the need to be able to parallel official exchange arrangements as reported by the International Monetary Fund, and by data limitations, particularly as regards market-determined interest rates.[2] However, most regions have adequate coverage, and both developed and developing countries are well represented in the sample.[3]

In addition to bilateral exchange rates and foreign exchange reserves, we also focus on the time series properties of nominal and real ex post interest rates. The bilateral exchange rate is end-of-period. Whenever possible, the interest rate used is that most closely identified with monetary policy; if that is not available, a treasury bill rate is used. The Data Appendix provides the details on a country-by-country basis. Our desire for a long sample covering many countries precludes using higher frequency data. Relatively few countries report foreign exchange reserve data on a daily or weekly basis, and for many of those that do it is a relatively recent phenomenon. Interest rates are included in the analysis because many countries, particularly in recent years, routinely use interest rate policy to smooth exchange fluctuations—the use of interest rate policy to smooth exchange rate

2. While data on exchange rates and reserves are readily available for a much larger set of developing countries, data on interest rates pose a problem in many cases, as they are riddled with large gaps and discontinuities.

3. Many small countries in Africa and the Western Hemisphere with a long history of fixed exchange rates (for instance, the CFA Franc Zone) are not well represented in our sample. As we are primarily interested in verifying whether countries that are currently (or previously) classified as floaters or managed floaters behave like the truly committed floaters, this does not seem like a serious omission.

fluctuations in the context of an inflation target is an issue we take up in the next section. We focus on the behavior of monthly percent changes (unless otherwise noted) of each variable, one at a time, and compare these across regimes.[4]

II.1. Methodology Issues

It is widely accepted that a "pure float" is an artifact of economics textbooks. Yet, despite occasional instances of foreign exchange market intervention, sometimes even in a coordinated fashion, the United States dollar (US$) floated about as freely against the German deutsche mark (DM) (and now the euro), and the Japanese Yen (¥), as any currency has ever been allowed to float. Thus, if the only criterion was the extent of commitment to float their currencies, the G-3 are the best candidates to serve as a benchmark for comparing whether countries that claim they float are indeed doing so. However, the wealthy G-3 countries all share the common feature that (in varying degrees) their currencies are the world's reserve currencies, which somewhat reduces their value as benchmarks for smaller industrial nations and, especially, for emerging market economies. However, another comparator is also available: Australia, with a credible commitment to floating, shares some features of the other smaller industrial nations and developing countries that make up the lion's share of our sample. For example, the Australian dollar is not a world reserve currency, and Australia continues to rely heavily on primary commodity exports, like many of the developing countries in our sample. As a consequence of the latter, its terms of trade exhibit a higher volatility than those of the G-3, and it is more representative of the characteristics of many of the non-G-3 countries in our study. Giving weight to both criteria (commitment to floating and shared characteristics), we opted to use both Australia and the G-3 as benchmarks.

Our strategy is to compare what countries say and what they do. What they say is reported to the IMF, which classifies countries into four types of exchange rate arrangements: peg, limited flexibility, managed floating, and freely floating. Limited flexibility has been used, almost exclusively, to classify European countries (prior to the monetary union) with exchange rate arrange-

4. In a longer working paper version of this paper, we also studied the behavior of the monetary aggregates, real ex post interest rates, and primary commodity prices (see Calvo and Reinhart [2001]).

ments vis-à-vis one another (i.e., the Snake, the Exchange Rate Mechanism, etc.).

What countries do can be described by the movement in their asset prices. Unless otherwise noted, the bilateral exchange rates are reported with respect to the DM for European countries and with respect to the United States dollar for everyone else. The choice of the DM owes to the fact that this was the most prominent reserve currency in Europe and, because Germany was the low inflation country for many years, the anchor for currencies in that region. For the remaining countries, the dollar is the usual anchor currency of choice. Indeed, the largest share of emerging market's external debt is denominated in US dollars, and world trade is predominantly invoiced in US dollars.

We denote the absolute value of the percent change in the exchange rate and foreign exchange reserves by ϵ, $\Delta F/F$, respectively. The absolute value of the change in the interest rate, $i_t - i_{t-1}$, is given by Δi. Letting x^c denote some critical threshold, we can estimate the probability that the variable x (where x can be ϵ, $\Delta F/F$, and Δi), falls within some prespecified bounds, conditional on a particular type of exchange rate arrangement. For example, if x^c is arbitrarily set at 2.5 percent, then the probability that the monthly exchange rate change falls within the 2.5 percent band should be greatest for the fixed exchange regimes and lowest for the freely floating arrangements, with the other two types of currency regimes positioned in the middle. In our notation, for $x = \epsilon$, we should observe

$$P(x < x^c|\text{Peg}) > P(x < x^c|\text{Float}) \text{ for } x = \epsilon.$$

Because shocks to money demand and expectations when the exchange rate is fixed are accommodated through purchases and sales of foreign exchange reserves, the opposite pattern should prevail for changes in foreign exchange reserves. Hence, for $x = \Delta F/F$,

$$P(x < x^c|\text{Peg}) < P(x < x^c|\text{Float}).$$

Thus, the probability that changes in reserves fall within a relatively narrow band is a decreasing function of the degree of exchange rate rigidity, as money demand shocks and changes in expectations are accommodated to prevent a change in the exchange rate.

Theory provides less clear-cut predictions as to how the volatility of interest rates could covary with the extent of exchange rate flexibility. Interest rates could fluctuate considerably if the monetary authorities actively use interest rate policy as a means of stabilizing the exchange rate—an issue that we will explore more formally in a simple setting in the next section. But policy is only a partial source of interest rate volatility. Interest rates are bound to be volatile if expectations about future inflation or exchange rate changes are unanchored, as is the case when the authorities lack credibility. Hence, the likelihood of observing relatively large fluctuations in interest rates would depend on both the degree of credibility and on the policymakers' reaction function.

While we also consider other statistical exercises in Section IV, examining the probabilities that the variable of interest stays within a prespecified band has some definite advantages over alternative descriptive statistics. First, it avoids the problem of outliers that can distort variances. For example, it is not uncommon in this sample (particularly for countries with capital controls or in the earlier part of the sample) to have a crawling peg exchange rate for an extended period of time (hence, some degree of exchange rate flexibility), with some periodic large devaluations (upward of 100 percent is not unusual) and return to a crawl. Brazil in the 1970s is a good example of this type of policy.[5] Short-lived inflationary spikes create similar problems for interest rates. Second, the probabilistic nature of the statistic conveys information about the underlying frequency distribution that is not apparent from the variance.

II.2. Measuring Volatility: Exchange Rates and Reserves

Tables I and II present evidence on the frequency distribution of monthly percent changes in the exchange rate, foreign exchange reserves, and nominal money-market interest rates for recent or current exchange rate regimes that are classified as freely floating regimes and managed floaters; Appendix 1 presents the comparable statistics for limited flexibility arrangements and peg episodes. The first column lists the country, the second the dates of the particular exchange arrangement, and the

5. As another example, the variance of the monthly exchange rate change over Pakistan's pegged episode, which ended in December 1981, was 119.42; excluding a single monthly observation (the devaluation of May 1972), the variance plummets to 0.85. Some of the problems with the alternative exchange rate classification proposed by Levy Yeyati and Sturzenegger [1999] rest on their heavy reliance on second moments distorted by outliers.

TABLE I

VOLATILITY OF SELECTED INDICATORS IN RECENT OR CURRENT “FLOATING” EXCHANGE RATE REGIMES

Country	Period	Probability that the monthly change is Within a ±2.5 percent band: Exchange rate	Reserves	Greater than ±4 percent (400 basis points): Nominal interest rate
(1)	(2)	(3)	(4)	(5)
Australia	**January 1984–November 1999**	**70.3**	**50.0**	**0.0**
Bolivia	September 1985–December 1997	93.9	19.6	14.8
Canada	June 1970–November 1999	93.6	36.6	2.8
India	March 1993–November 1999	93.4	50.0	23.8
Kenya	October 1993–December 1997	72.2	27.4	15.7
Japan	February 1973–November 1999	61.2	74.3	0.0
Mexico	December 1994–November 1999	63.5	28.3	37.7
New Zealand	March 1985–November 1999	72.2	31.4	1.8
Nigeria	October 1986–March 1993	74.5	12.8	1.4
Norway	December 1992–December 1994	95.8	51.9	4.1
Peru	August 1990–November 1999	71.4	48.1	31.4
Philippines	January 1988–November 1999	74.9	26.1	1.5
South Africa	January 1983–November 1999	66.2	17.4	0.5
Spain	January 1984–May 1989	93.8	40.1	4.1
Sweden	November 1992–November 1999	75.5	33.3	1.3
Uganda	January 1992–November 1999	77.9	32.9	3.6
United States$/DM	February 1973–November 1999	58.7	62.2	0.3

Source: *International Financial Statistics*, International Monetary Fund.

TABLE II
VOLATILITY OF SELECTED INDICATORS IN "MANAGED FLOATING" EXCHANGE RATE REGIMES

		Probability that the monthly change is		
		Within a ±2.5 percent band:		Greater than ±4 percent:
Country (1)	Period (2)	Exchange rate (3)	Reserves (4)	Nominal interest rate (5)
Bolivia	January 1998–November 1999	100.0	12.5	0.0
Brazil	July 1994–December 1998	94.3	51.8	25.9
Chile	October 1982–November 1999	83.8	48.2	51.2
Colombia	January 1979–November 1999	86.8	54.2	2.9
Egypt	February 1991–December 1998	98.9	69.4	0.0
Greece	January 1977–December 1997	85.3	28.9	0.7
India	February 1979–November 1993	84.5	36.7	11.2
Indonesia	November 1978–June 1997	99.1	41.5	5.2
Israel	December 1991–November 1999	90.9	43.8	1.1
Kenya	January 1998–November 1999	70.6	14.3	1.1
Korea	March 1980–October 1997	97.6	37.7	0.0
Malaysia	December 1992–September 1998	81.2	55.7	2.9
Mexico	January 1989–November 1994	95.7	31.9	13.9
Norway	January 1995–November 1999	90.2	42.3	0.0
Pakistan	January 1982–November 1999	92.8	12.1	14.1
Singapore	January 1988–November 1999	88.9	74.8	0
Turkey	January 1980–November 1999	36.8	23.3	61.4
Uruguay	January 1993–November 1999	92.0	36.5	60.1
Venezuela	April 1996–November 1999	93.9	29.4	n.a.

Source: *International Financial Statistics,* International Monetary Fund.

remaining columns the relevant probability for changes in the exchange rate, international reserves, and interest rates, in that order. For exchange rates and foreign exchange reserves, our chosen threshold value is $x^c = 2.5$ percent, which is a comparatively narrow band. For instance, following the Exchange Rate Mechanism crisis, many European countries adopted a ±15 percent band for the exchange rate. Chile, until recently, had comparable bands. Other examples include Mexico (prior to December 1994) which had in place an "ever-widening" band, as the lower end (appreciation) of the band was fixed and the upper ceiling (depreciation) was crawling; Israel and Colombia (during 1994–1998) also had fairly wide bands.[6]

For the United States, for example, as shown in column (3) of Table I, there is about a 59 percent probability that the monthly US$/DM exchange rate change would fall within a relatively narrow plus/minus 2 ½ percent band. For the US$/¥ exchange rate, that probability is slightly higher, at 61 percent. By contrast, for Bolivia, Canada, and India (all declared floaters during that period), the probability of staying within the band is around 95 percent—significantly above the benchmark of Australia, where the comparable probability is about 70 percent.[5] Put in another way, there is only about a 5 percent probability in those three countries that the exchange rate will change more than 2 ½ percent in any given month. On average, for this group of floaters, the probability that the exchange rate change is contained in this moderate plus/minus 2 ½-percent band is over 79 percent—significantly above that for Australia, Japan, and the United States. The t-statistic for the difference in means test is 3.38 with a probability value of (0.00) under the null hypothesis of no difference. By this metric, post-crisis Mexico approximates a float more closely than any of the other cases—including Canada.[7]

Moderate-to-large monthly fluctuations in the exchange rate are even rarer among the so-called "managed float" episodes (Table II). For Egypt and Bolivia the probability of a monthly exchange rate change greater than 2.5 percent is nil—as was the case for Indonesia and Korea up to the 1997 crisis. Even for self-proclaimed flexible-rate advocates, such as Chile and Singapore, the frequency distribution of their monthly exchange rate fluctuations relative to the US dollar do not vaguely resemble that of Australia, let alone the US$/DM or US$/¥. Even a casual inspection reveals that a significantly higher proportion of observations falls within the 2 ½ percent band. On average, there is an 88 percent probability that managed floaters' monthly changes in the exchange rate are confined to this narrow band. This exchange rate stability versus the US dollar (or DM if it is a

6. In a longer working paper version, we also report comparable statistics for a ±1 percent band.

7. The variance of the monthly changes Mexican peso/US$ is about twice as large as the variance of the monthly changes in the ¥/US$ exchange rate (see Calvo and Reinhart [2001]).

For a study of Peru's fear of floating, see Morón, Goñi, and Ormeño [1999], who estimate an implicit intervention band. For a discussion on East Asia's Dollar Standard, see McKinnon [2001].

European country) is surprising in light of the fact that for many emerging market countries during these episodes, inflation rates were well above U. S. or German levels, terms-of-trade shocks were frequent and large, and macroeconomic fundamentals were markedly more volatile than in any of the benchmark countries. Not surprisingly, the evidence presented in Appendix 1 shows that for limited flexibility arrangements and for pegs the probabilities that exchange rate changes are confined to this band are even greater, at 92 and 95 percent, respectively. Hence, the observed behavior accords with the priors that exchange rate variability is least for pegs and greatest for floaters. For the Float-Peg difference, the probability value from the means test is (0.00); for the Float-Managed, it is (0.04); for the Managed-Limited flexibility, the means test of the probability value is (0.32) while for the Limited flexibility-Peg it is (0.44).

Yet, we cannot glean from exchange rates alone what would have been the extent of exchange rate fluctuations in the absence of policy interventions; that is, we do not observe the counterfactual. To assess the extent of policy intervention to smooth out exchange rate fluctuations, we next examine the behavior of foreign exchange reserves. In principle, the variance of reserves should be zero in a pure float. In reality, however, it is not that simple, as reserves may change because of fluctuations in valuation and the accrual of interest earnings.[8] However, even absent these, there are other factors that influence changes in reserves. First, there are "hidden" foreign exchange reserves transactions. Credit lines may be used to defend the exchange rate during periods of speculative pressures. Indeed, several European countries made ample use of their lines of credit during the Exchange Rate Mechanism (ERM) crisis of 1992–1993. Central banks may engage in derivative transactions, much along the lines of Thailand in 1997, which borrowed dollars in the futures market, or issue debt denominated in a foreign currency, such as Brazil among others. These transactions hide the true level and variation in reserves. Second, even in the absence of any "hidden" reserve transactions, countries may rely more heavily on domestic open market operations and interest rate changes to limit exchange rate.

8. For instance, in the case of New Zealand, reserves fluctuate due to the Treasury's management of its overseas currency debt rather than foreign exchange market intervention. We thank Governor Brash (in personal correspondence) for pointing this out.

Column (4) of Tables I and II summarizes the frequency distribution of monthly foreign exchange reserve changes (in US dollars). With the exception of the United States and the few European countries in the sample, most countries represented in Tables I and II hold most of their foreign exchange reserve holdings in dollar-denominated assets—hence, for this group valuation changes are not much of an issue.[9] As Table I shows, there is about a 74 percent probability that Japan's monthly changes in foreign exchange reserves fall in a plus/minus 2.5 percent band, while for Australia the comparable probability is 50 percent. Yet, in the case of Mexico, there is only a 28 percent probability that changes in foreign exchange reserves are that small, while in the case of Bolivia that probability is even lower; note that for post-crisis Thailand there is only a 6 percent probability that reserves changes are inside the band.[10] Indeed, for all other countries, large swings in foreign exchange reserves appear to be commonplace, consistent with a higher extent of intervention in the foreign exchange market—relative to what is to be expected a priori from a freely floating exchange rate regime. Nor is this exclusively an emerging market phenomenon—Canada's reserve changes are about seven times as volatile as those of the United States. For the group of "floaters" the average probability (shown in the right-hand panel of Figure I) is about 34 percent—about one-half the Japan-United States average and significantly below the Australian benchmark. The difference is statistically significant. Indeed, the observed behavior of international reserves runs counter to our priors—$P(\Delta F/F, < x^c|\text{Peg}) < P(\Delta F/F, < x^c|\text{Float})$. We find that reserve variability is highest for the "floaters" and least for the limited flexibility arrangements. This point is made starkly in the top panel of Figure I, which plots the probability that the monthly exchange rate change lies within a 2 ½ percent band (along the horizontal axis) and the probability that foreign exchange reserves change more that 2 ½ percent (along the vertical axis) for the four currency regimes and our three comparators. Two points are evident. First, the range of observed ex-

9. One may also want to construct an estimate of interest earned by the reserve holdings and adjust the reported stocks accordingly. This is work in progress.

10. So while monthly changes in the Mexican peso/US$ exchange rate are almost twice as variable as monthly changes in the ¥/US$ rate—changes in Mexico's reserves are 18 times as volatile as changes in U. S. reserves and 25 times as variable as changes in Japan's reserves and more than four times as volatile as Argentina's reserves.

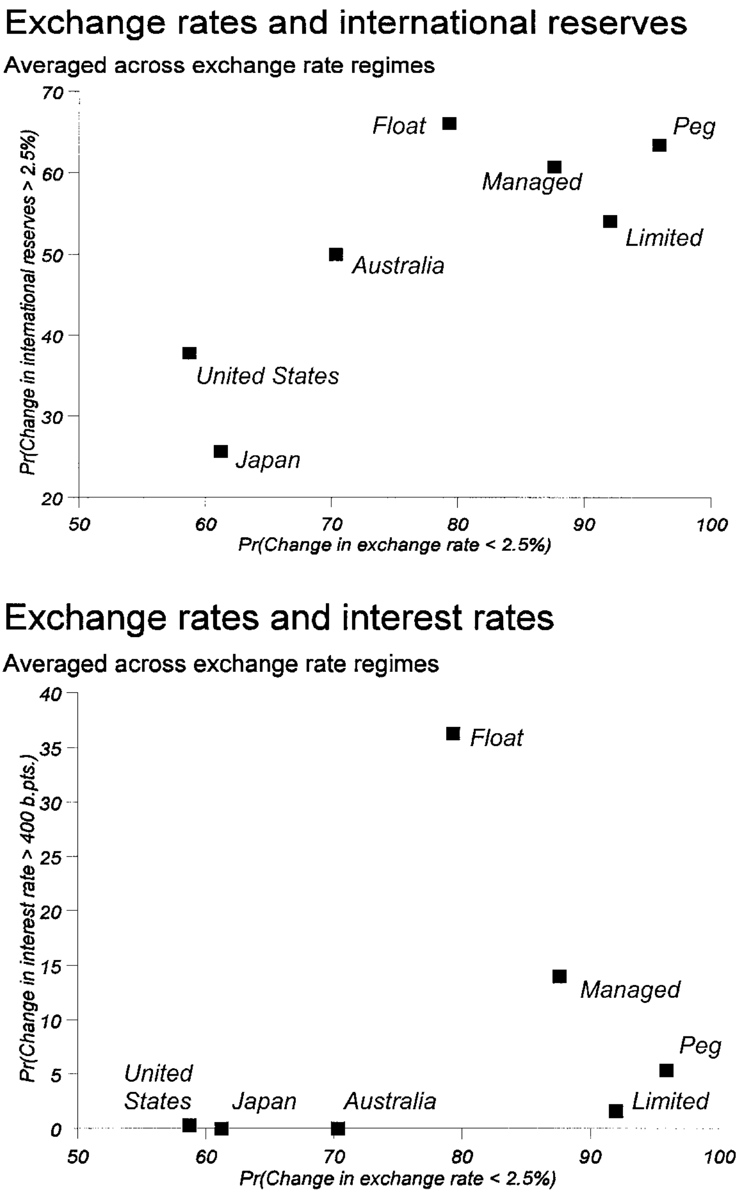

FIGURE I

Source: Tables I and II and Appendix 1.

change rate variation is quite narrow, with all four regimes associated with a higher chance of changing in a narrow band than any of the three benchmarks. Second, the smoothness in the exchange rate seems to be the result of explicit policy choice: international reserves move more from month to month for those countries with the more stable exchange rates.

II.3. Interest Rate Volatility, Lack of Credibility, and Monetary Policy

As discussed earlier, policy intervention to dampen exchange rate fluctuations is not limited to purchases and sales of foreign exchange. Interest rates in the United States, Japan, Australia, and other developed economies are usually set with domestic considerations in mind. Yet, in many of the other countries in our sample, the authorities who set domestic interest rates accord a much higher weight to the stabilization of the exchange rate—particularly when there are credibility problems or a high pass-through from exchange rates to prices. This is also the case for countries which have inflation targets and have a high pass-through from exchange rates to prices, which is the case we model in Section III. For evidence that pass-through tends to be higher for emerging markets, see Calvo and Reinhart [2001]. This policy, coupled with credibility problems, may help explain the high relative volatility of interest rates in these countries. As shown in Table I, while the probability that interest rates change by 400 basis points (4 percent) or more on any given month is about zero for Australia, Japan, and the United States, that probability is close to 40 percent for Mexico and about 30 percent for Peru and India (among the floaters). Nominal and real interest rates in India are about four times as variable as in the United States; for Mexico, interest rates are about twenty times as variable—Peru holds the record.[11] A recent example of Chile and Mexico's use of high interest rates as a means to limit exchange rate pressures (despite a markedly slowing economy and an adverse terms-of-trade shock) comes from the aftermath of the Russian crisis in August 1998. At the time of this writing, Brazil's central bank hiked interest rates in the midst of a recession and an energy crisis to halt the slide of its currency, the real.

These examples, however, are not unique in emerging markets. Among the managed floaters (Table II), other emerging

11. See Calvo and Reinhart [2000] for details.

markets, including Brazil, Turkey, and Uruguay have an equally high or higher incidence of large fluctuations in interest rates. While in the case of Turkey and Uruguay, it is at least partially due to their comparatively high inflation rates, this is not the case for the others. The picture painted by the volatility of real ex post interest rates is quite similar.[12]

When comparing the four types of exchange rate regimes, interest rates are the most stable for the limited flexibility group—which is almost exclusively made up of European developed countries—and least stable for the managed floating group, which is comprised predominantly of developing countries.[13] Indeed, Calvo and Reinhart [2001] show that the variance of interest rates in low inflation in emerging markets is about four times that of developed economies, and that gap is far greater for countries with a history of inflation.

Moreover, such interest volatility is not the result of adhering to strict monetary targets in the face of large and frequent money demand shocks. In reality, most of these countries do not have explicit or implicit money supply rules. Interest rate volatility would appear to be the byproduct of a combination of trying to stabilize the exchange rate through domestic open market operations and lack of credibility. These findings are summarized in the lower panel of Figure I, which plots the relative probabilities of small changes in the exchange rate (again, along the horizontal axis) and large changes in the nominal interest rate (the vertical axis). As is evident, the countries that move their interest rates the most are those that, by self-identification, would seem to have to move them the least—those that follow a float or a managed float.

II.4. General Observations about the Findings

In this section we have presented evidence that the variability in international reserves and interest rates is high relative to the variations in the exchange rate. Taken together, these findings would suggest that in many cases the authorities are attempting to stabilize the exchange rate through both direct intervention in the foreign exchange market and open market

12. See the working paper version of this paper.

13. It is important to note that some countries with a highly regulated financial sector and limited capital mobility simultaneously show exchange rate and interest rate stability; examples include Egypt, India (in the earlier managed floating period), Kenya, and Nigeria.

operations. Furthermore, "fear of floating" does not appear to be limited to a particular region. Indeed, it would appear that in emerging markets floating has been largely confined to brief periods following currency crises or chaotic episodes of high inflation—an issue we examine in greater detail in Section IV. In the next section we develop a simple framework that replicates these stylized facts and provides a rationale for fear of floating.

III. INFLATION TARGETING, LACK OF CREDIBILITY, AND FEAR OF FLOATING

There are multiple reasons why countries may be reluctant to tolerate much variation in their exchange rates.[14] Liability dollarization, which is pervasive in emerging markets, may produce a fear of floating. In Lahiri and Végh's [2001] model, fear of floating arises because there is an output cost associated with exchange rate fluctuations; in the Caballero and Krishnamurthy [2001] setting, an inelastic supply of external funds at times of crises explains exchange rate overshooting and fear of floating. Calvo and Reinhart [2001] stress concerns about lack of credibility and loss of access to international capital markets.

In this paper we present a simple model where fear of floating arises from the combination of lack of credibility (as manifested in large and frequent risk-premiums shocks), a high pass-through from exchange rates to prices, and inflation targeting. It is worth pointing out that lack of credibility in this setting is not manifested in first moments. Lack of credibility is associated with the (higher) variance of the risk premiums shocks. This setting is motivated by the recent trend in emerging markets to couple floating with explicit inflation targets. Indeed, at present, this combination appears to have become the most popular alternative to fixing the exchange rate.[15]

Explanations of a central bank's choice of the expansion of nominal magnitudes have often been framed as some variant of

14. See also Hausmann, Panizza, and Stein [2001].

15. Inflation targeters include Australia (September 1994), Brazil (June 1999), Canada (February 1991), Colombia (September 1999), Czech Republic (January 1998), Finland (February 1993–June 1998), Israel (January 1992), South Korea (January 1998), Switzerland (January 2000), Mexico (January 1999), New Zealand (March 1990), Peru (January 1994), Poland (October 1998), South Africa (February 2000), Spain (November 1994–June 1998), Sweden (January 1993), Thailand (April 2000), and United Kingdom (October 1992). The dates in parentheses, which indicate when inflation targeting was introduced, highlight that for most of the emerging markets the policy change is relatively recent.

Barro and Gordon's [1983] rules-versus-discretion model, whether allowing for uncertainty (as in Canzoneri [1985]), heterogeneity among potential central bankers (as in Rogoff [1985]), or even electoral choice among central bankers (as in Alesina and Grilli [1992]). Policy is cast as attempting to reconcile the long-run benefits of low inflation with the temptation to get extra output in the near term by generating an inflation surprise that works through a Phillips curve.

It could be argued that a formulation that describes discretionary monetary policy as attempting to exploit a Phillips curve is of little practical relevance for most emerging markets. A history of high and variable inflation in many emerging markets has eroded any meaningful trade-off between unemployment and inflation surprises. Furthermore, even in the absence of a notorious inflation history, the evidence suggests that monetary policy is often procyclical—as central banks raise interest rates in bad states of nature to restore investor confidence and stem capital outflows. Yet, this does not imply that the central bank is indifferent to inflation surprises. Indeed, in many emerging markets there has been a tendency to use inflation surprises to improve the government's fiscal position. Overreliance on the inflation tax (and other easy-to-implement taxes, such as tariffs) may be due to the fact that in many emerging markets tax collection is inefficient and evasion is rampant. That is, the benefits to the monetary authority are that surprise inflation generates additional revenue from money creation and erodes the real value of nominal government debt and public sector wages.

It could also be argued that the focus on a closed economy controlling the domestic inflation rate limits the seeming relevance of Barro-Gordon models for many developed and emerging market countries alike. In fact, central bankers in emerging market economies appear to be extremely mindful of external factors in general and the foreign exchange value of their currency, in particular. In what follows, the policy choice explicitly considers the problem of a small open economy setting its nominal interest rate.

Consider one period of an infinitely lived sequence.[16] Households make two sets of decisions at the start of the period based on incomplete information; that is, before shocks are realized. As workers, they bargain for nominal wages that will prevail over

16. We will suppress time subscripts where possible.

the period in anticipation that goods and service price inflation will equal π^e. As investors, they place part of their assets at banks in deposits that do not bear interest, implying an opportunity cost that is expected to be i^e, the market-based return on domestic government debt.

Foreign investors also hold domestic debt, with the home interest rate linked to the foreign interest rate i^*, by uncovered interest parity. Defining s to be the price of foreign currency in terms of domestic currency so that when s rises (falls), the home currency depreciates (appreciates). If ϵ is the expected rate of change in the exchange rate, then the uncovered interest parity condition holds up to a risk premium ρ:

$$i = i^* + \epsilon + \rho. \tag{1}$$

The risk premium is assumed to be a random shock, drawn from a distribution with mean $\mu_\rho = 0$ and variance σ_ρ^2. To keep notational clutter to a minimum, we will assume that the mean to the risk premium shock equals zero.

From the government's perspective, the public's willingness to hold money balances must be supported by noninterest-bearing domestic reserves, issued in the amount R. Because a central bank's balance sheet must balance, these domestic reserves can also be expressed in terms of their asset counterparts, foreign exchange reserves, and domestic credit. Since the central bank can issue R, this implies that it can issue less interest-bearing obligations. This interest saving is one measure of the seigniorage from money creation,

$$i(R/p), \tag{2}$$

where p is the domestic price level.[17] Our simplification of a fractional banking system is to assume a constant money multiplier k, so that

$$M = kR. \tag{3}$$

The demand for domestic real balances is written as a linear approximation,

$$M/p = c - \eta i^e + \zeta, \tag{4}$$

where ζ represents a random shock with mean zero and variance

17. In a growing economy, seigniorage would also include the increase in real balances induced as income expands.

σ_ζ^2. As before, the assumption is that households place their balances at banks before the outcome of financial market clearing is known. Thus, the opportunity cost of holding money must be forecasted rather than known with certainty.

As a consequence of this specification of the financial sector, seigniorage can be written as

$$i\,\frac{c - \eta i^e + \zeta}{k}. \tag{5}$$

Notice the key wedge between anticipations and actions opened up in this product: seigniorage depends on both the expected interest rate (which determines the real stock of reserves) and the actual interest rate (which determines the earning rate of those reserves).

We also assume that foreign and domestic goods, prices at p^* and p, respectively, are perfect substitutes:

$$p = sp^*, \tag{6}$$

so that purchasing power parity prevails, which completes the description of economic behavior that the central bank takes as given. This, of course, implies a pass-through of unity from exchange rate to prices. This assumption can be relaxed without altering the qualitative results of the model. Here we assume that purchasing power of parity holds for "the" relevant country in the region; if there were more currencies, the analysis could also be extended to include less-than-unit pass-through.

Each period, the central bank is assumed to maximize its welfare, which is increasing in its seigniorage and decreasing in the deviation of the inflation rate from its target, with the target taken to be zero to save on notation. This welfare function can be written as

$$W = i\,\frac{R}{p} - \frac{b}{2}\,\pi^2, \tag{7}$$

where b is a coefficient representing the welfare loss (relative to one unit more of seigniorage) from inflation deviating from its target in either direction.

The two parity conditions combine to explain domestic inflation in terms of domestic nominal interest rates and variables from the external sector. As a result,

$$\pi = i - i^* - \rho + \pi^*. \tag{8}$$

Assuming that the foreign nominal interest rate and inflation rate equal zero, the objective function of the central bank can be written as

$$W = i\,\frac{c - \eta i^e + \zeta}{k} - \frac{b}{2}\,(i - \rho)^2. \tag{9}$$

First, we find the welfare-maximizing interest rate taking expectations as given. From the first-order condition we get,

$$i = \rho + (c - \eta i^e + \zeta)/bk. \tag{10}$$

As is evident, in setting the nominal interest rate, the central bank responds one for one to risk premium shocks but proportionally to money demand shocks. The key tension that produces time inconsistency is that the central bank's desired setting of the ex post nominal interest rate depends negatively on interest rate expectations, which are formed earlier in the period.

Second, on average, those expectations should be correct. This places the condition on the model that

$$i^e = c/(bk + \eta). \tag{11}$$

Even though both the real interest rate and the inflation target are zero, households will expect a positive nominal interest rate, implying that they expect some inflation. This is due to the presence of seigniorage in the objective function. The greater the weight on the inflation target, the smaller will be this inflation premium (as $b \to \infty$, then $i^e \to 0$).

It is important to note that there are two elements to this premium due to the importance of seigniorage itself in the objective function and the temptation to generate surprise inflation to get extra seigniorage because money demand depends on the expected interest rate. If money demand were to depend on the actual interest rate, that second element would be eliminated, although the first alone would still produce inflation in the long run. It can be shown in that circumstance that the expected nominal interest rate would equal

$$c/(2\eta + bk), \tag{12}$$

which is smaller than that in the baseline model. The difference between the two represents, in Rogoff's [1985] term, the premium paid to investors because the central bank succumbs to the temptation to cheat systematically. The irony, of course, in all these models is that systematic cheating yields no return.

The representation for interest rate expectations in the baseline model can be substituted into the interest rate equation. This yields an expression for the optimal setting of the nominal interest rate in the presence of shocks to asset holding—namely the risk premium and money demand,

$$i = \rho + \frac{\zeta}{bk} + \frac{c}{bk + \eta}. \tag{13}$$

Given our assumption that the shocks are uncorrelated, the variance of the domestic nominal interest rate is given by

$$\sigma_i^2 = \sigma_\rho^2 + \sigma_\zeta^2/b^2k^2. \tag{14}$$

Note that the variance of the nominal interest rate declines as the commitment to the inflation target rises (b is larger) but increases when credibility is low; that is, when the variance of risk premium shocks are large. Emerging markets are routinely buffeted by large swings in risk premiums. This is evident, for example, in the volatility of emerging market sovereign credit ratings (see Reinhart [2001]). But still, even under an extreme commitment to an inflation target, nominal interest rates will vary as the central bank finds it optimal to offset risk premium shocks.

The other variables of interest follow directly. The expected change in the exchange rate will be, $i - \rho$, or

$$\epsilon = \frac{\zeta}{bk} + \frac{c}{bk + \eta}. \tag{15}$$

That is, in setting its nominal interest rate, the central bank will completely offset the effects on the exchange rate of foreign risk premium shocks and partially offset money demand shocks. The greater the importance of the inflation target, the greater will be the offset of money demand shocks.

As a result, the variance of the change in the exchange rate can be written as

$$\sigma_{\epsilon}^2 = \sigma_{\zeta}^2/b^2k^2. \tag{16}$$

Because risk premium shocks are offset completely, the variance of the exchange rate is independent of the variance of the risk premium. Moreover, the greater the commitment to an inflation target, the smaller will be the variance of the change in the exchange rate. Hence, in this setting inflation targeting can explain fear of floating.

The real domestic monetary base will equal

$$\frac{R}{p} = \frac{cb}{bk + \eta} + \frac{\zeta}{k}. \tag{17}$$

The level of real balances increases directly with the weight on inflation, in that a stronger commitment to low inflation generates a greater willingness to hold real balances. Real reserves also vary one for one with the money demand shock but are invariant to the risk premium shock. The reason, of course, that real reserves are invariant to the risk premium shock is that the decision by domestic investors to hold money balances depends on the expected, not actual, domestic interest rate.

Given this, the variance of the real monetary base will equal

$$\sigma_{R/p}^2 = \sigma_{\zeta}^2/k^2. \tag{18}$$

As Calvo and Guidotti [1993] point out, the cost of discretionary policy is due to its effect on expectations, which induce households to change their behavior regarding real magnitudes. The cost of a policy that alters expectations has to be weighed against the possibility of reducing the variance of real magnitudes by offsetting shocks realized after expectations are formed. In our framework, smoothing the exchange rate reduces the variation in real outcomes. Offsetting risk premium shocks and thereby damping fluctuations in the exchange rate limits unnecessary variations in domestic inflation. For an inflation targeter, this may be an end that appears particularly attractive.

It is useful to define a variance ratio that captures the variation in the exchange rate relative to policy instruments—the domestic nominal interest rate and reserves—a form of exchange rate flexibility index. In particular,

$$\lambda = \sigma_{\epsilon}^2/(\sigma_i^2 + \sigma_{R/p}^2). \tag{19}$$

In this model, this term reduces to

$$\lambda = \frac{\sigma_{\zeta}^2}{(1 + b^2)\sigma_{\zeta}^2 + b^2k^2\sigma_{\rho}^2} < 1. \tag{20}$$

Note that this variance ratio goes to one as the weight on the inflation target declines. Conversely, as the weight on the inflation target increases, the variance ratio tends to zero. In the next section we examine the empirical relevance of this issue by contrasting the readings of the variance ratio given by equation (19) with the actual inflation performance for the various exchange rate arrangement episodes in our sample.

IV. An Exchange Rate Flexibility Index: Basic Tests and Comparisons

We begin this section by conducting some basic tests to assess the extent of foreign exchange market intervention (as measured by variability in foreign exchange reserves) in the 155 episodes that make up our study. We then proceed to construct an exchange rate flexibility index, along the lines suggested by the model in Section III. In both of these exercises, we compare those cases classified as floaters and managed floaters to the benchmark of the committed floaters (here taken to be Australia, Japan, and the United States).

IV.1. F-tests

As noted in Section II, with regard to exchange rates, interest rates, and other nominal variables in the local currency, outliers can significantly distort the variances of some of these variables. In the case of international reserves, which are reported in dollars and are less affected by periodic mega-devaluations or inflationary spikes, the outlier problem is somewhat less severe. Hence, in what follows, our emphasis will be on the variability of international reserves—although in the next subsection we construct a flotation index that is multivariate, as it includes the variances of the exchange rate and an interest rate.

TABLE III
PROPORTION OF CASES WHERE THE VOLATILITY OF RESERVES SIGNIFICANTLY EXCEEDS THAT OF THE BENCHMARK COUNTRY: SUMMARY OF THE F-TESTS

Regime according to IMF classification	Number of cases	Benchmark is Australia	Japan	United States
Peg	70	81.4	95.7	92.9
Limited flexibility	11	72.7	100	90.9
Managed floating	43	76.2	88.4	88.4
Floating	31	73.3	97.3	87.1
All	155	77.8	93.5	90.9

The alternative hypothesis, if fear of floating is present, is that the variance in reserves for country and episode I is greater than that for the benchmark country, b. Denoting the variance of reserves by σ_R^2, the alternative hypothesis is thus, $\sigma_{Ri}^2 > \sigma_{Rb}^2$. The individual case-by-case results of the F-tests are available from the authors upon request.

As to the F-tests, the null hypothesis being tested is the equality of variances between the committed floaters and the particular country/episode in question; the alternative hypothesis is that, if there is fear of floating, the variance of reserves for the episode in question will exceed that of the more committed floaters serving as a benchmark. Hence, it is a one-tailed test. The results of the F-tests are summarized in Table III.[18] If the Australian benchmark is used, in those episodes classified as floaters, the null hypothesis of the equality of variances in favor of the alternative hypothesis (consistent with the fear of floating phenomenon) is rejected in 73 percent of the cases. If, instead, Japan is used as a benchmark, the null hypothesis can be rejected for 97 percent of the cases. For the managed floaters, there is a similarly high incidence of rejection of the null hypothesis. In effect, in the majority of cases, the variance of foreign exchange reserves is several orders of magnitude greater than for Australia, Japan, or the United States. It is also noteworthy that the results of these tests reveal that rejection of the null hypothesis is not appreciably different for the floaters than for those with fixed exchange rates or more limited flexibility arrangements. While on the surface this result seems paradoxical, it is consistent with both a high incidence of fear of floating among the group classified as floaters

18. The individual country and episode (there are 155 of these) results are available in the background material to this paper at www.puaf.umd.edu/papers/reinhart.htm.

and a higher incidence of capital controls among the fixers. If binding, the controls can help stabilize the exchange rate without the need for large fluctuations in international reserves.

IV.2. An Exchange Rate Flexibility Index

As discussed above, there is no single all-encompassing indicator that provides an adequate measure of the extent of exchange rate flexibility allowed by the monetary authorities. Yet from the model developed in Section III, we can motivate the construction of a multivariate index that captures different manifestations of the extent of exchange rate variability relative to the variability of the instruments that are at the disposal of the monetary authorities to stabilize the exchange rate.

As noted earlier, domestic reserves R can also be expressed in terms of their asset counterparts, which includes foreign exchange reserves F. As the results of the F-tests attest, reserve variability is significantly higher for the less committed floaters than for the benchmark countries. Furthermore, it is well-known that foreign exchange market intervention is commonplace in many of the cases studied here. For this reason, in the empirical application of the model, we focus on a variance ratio that looks at the central bank balance sheet from the asset side, implying that equation (19) should be modified to

$$\lambda = \sigma_{\epsilon}^2/(\sigma_i^2 + \sigma_F^2). \tag{21}$$

The values λ can range from zero, when there is a peg or a very high degree of commitment to inflation targeting, to one when seignorage has a high weight in the policymaker's objective function. As shown in Table IV, in about 83 percent of the cases the index of exchange rate flexibility is below that of Australia—for Japan and the United States the share of cases below these two benchmarks is 95 and 90, respectively. When we disaggregate the advanced economies from the emerging market countries, no obvious differences emerge on the proportion of cases that lie below and above the three benchmarks. Separating the two groups does shed light on the "causes" behind the high readings. For the advanced economies, there is no obvious link between a high flexibility index reading and high inflation or rising inflation, as is usually the case following a currency crisis. For emerging markets, however, between 66 and 93 percent of the cases

TABLE IV
PROBABILITIES OF "FLOATING" IN COMPARISON TO THE BENCHMARK COUNTRY: A COMPOSITE INDEX OF EXCHANGE RATE FLEXIBILITY

	Benchmark is		
Proportion of total cases where	Australia	Japan	United States
All countries			
Index is below benchmark	83.0	95.0	90.0
Index is above benchmark	17.0	5.0	10.0
Advanced economies			
Index is below benchmark	78.0	100.0	90.0
Index is above benchmark	22.0	0.0	10.0
Of which: high inflation: 30 percent cutoff	0.0	0.0	0.0
Of which: post-crisis	0.0	0.0	0.0
Emerging market economies			
Index is below benchmark	85.7	91.4	90.0
Index is above benchmark	14.3	8.6	10.0
Of which: high inflation	33.0	42.9	42.9
Of which: post-crisis	30.0	50.0	42.9

Source: The authors. The indices for the individual country episodes are not reported here to economize on space but are available at www.puaf.umd.edu/papers/reinhart.htm.

The high inflation cutoff is 30 percent or higher during the episode in question; this is in keeping with the threshold used by Easterly [1998] and others.

For, the United States, the index uses the US$/DM (subsequently euro) exchange rate; very similar results obtain if the US dollar/yen exchange rate is used.

a. Another 22 percent of the cases above the Australian benchmark were accounted for by the G-3 countries.

(depending on whether the Australia or Japan benchmark is used) recording a "higher degree of variability" either had inflation rates above 30 percent per annum or the period in question is immediately following a currency crisis. This finding is broadly consistent with the model's predictions that the higher the weight placed on seignorage relative to the inflation target, the more variable the exchange rate relative to the instruments of policy, as the shocks to the risk premiums will not be offset to the same degree if the commitment to an inflation target is not binding.

Furthermore, the mode index level for emerging markets is well below the mode for the advanced economies group. This is also in line with the predictions of the model. The variance of nominal interest rates is determined on a one-to-one basis by the variance of risk premium shocks, σ_ρ^2 (equation (14))—as discussed earlier, risk premiums are far more volatile in emerging markets than in developed economies.

V. Concluding Remarks

Announcements of intentions to float, to be sure, are not new. The Philippines announced it would float on January 1988, yet less than ten years later, following its 1997 currency crises, its exchange rate policy would be lumped together with the rest of the affected Asian countries, under the commonly used (but ill-defined) label of a "soft peg." Bolivia announced it would float on September 1985, because of its hyperinflation—despite this announcement its exchange rate so closely tracked the United States dollar that the regime was reclassified as a managed float on January 1998. Korea and Thailand, despite their relatively new floating status, seem to amass reserves at every possible opportunity.[19]

While these episodes provide anecdotal evidence that countries may be reluctant to allow their currencies to float, the systematic evidence presented in this paper suggests that the fear of floating phenomenon is, indeed, widespread and cuts across regions and levels of development. Fear of floating—or more generally, fear of large currency swings—is pervasive for a variety of reasons, particularly among emerging market countries. The supposedly disappearing middle account makes up the predominant share of country practices. Indeed, one of the hardest challenges trying to draw lessons from the experiences of countries that are at the corners is that there are so few to study. The experiences of some of the floaters like the United States and Japan may not be particularly relevant for developing countries. Similarly, the number of countries with hard pegs is so small (excluding small islands) that it is difficult to generalize.

We have presented evidence in this paper that, when it comes to exchange rate policy, the middle has not disappeared. Yet, there is an apparent change in the conduct of monetary-exchange rate policy in many emerging markets—interest rate policy is (at least partially) replacing foreign exchange intervention as the

19. Of course, one interpretation of these developments is that, burned by the liquidity shortage faced during the 1997–1998 crisis, these countries are seeking to build a "war chest" of international reserves in order to avoid having similar problems in the future.

preferred means of smoothing exchange rate fluctuations. This is evident in the high variability of interest rates in developing economies and in the practices of countries like Mexico and Peru. The use of interest rate policy to smooth exchange rate fluctuations has received considerable attention in recent years; see, for example, Lahiri and Végh [2000] and references therein.

Our finding that so many of the episodes that come under the heading of floating exchange rates look similar to many of the explicit less flexible exchange rate arrangements may help explain why earlier studies, which relied on the official classifications of regimes, failed to detect important differences in GDP growth rates and inflation, across peg and the floating regimes.[20]

In sum, economic theory provides us with well-defined distinctions between fixed and flexible exchange rate regimes, but we are not aware of any criteria that allow us to discriminate as to when a managed float starts to look like a soft peg. Indeed, the evidence presented in this paper suggests that it is often quite difficult to distinguish between the two. On the basis of the empirical evidence, perhaps, all that we can say is that, when it comes to exchange rate policy, discretion rules the day.

Data Appendix: Definitions and Sources

This appendix describes the data used in this study and their sources. IFS refers to the International Monetary Fund's *International Financial Statistics.*

1. Exchange rates. Monthly end-of-period bilateral exchange rates are used. For the European countries it is bilateral exchange rates versus the deutsche mark, except pre-1973, where it is bilateral rates versus the US dollar. For selected African countries (as noted) bilateral exchange rates versus the French franc are used, while for the remaining countries, which constitute the majority, it is bilateral rates versus the US dollar. We focus on monthly percent changes. Source: IFS line ae.
2. Reserves. Gross foreign exchange reserves minus gold. As with exchange rates, we use monthly percent changes. Source: IFS line 1L.d.

20. See, for instance, Baxter and Stockman [1989], Ghosh, Gulde, Ostry, and Wolf [1997], and Edwards and Savastano [2000] for a review of this literature.

3. Nominal interest rates. Where possible, policy interest rates were used. As these vary by country, the table below summarizes for each country which interest rate series is used and its source.
4. Real ex post interest rates. The nominal interest rates listed above, deflated using consumer prices (IFS line 64), expressed in percentage points. The real interest rate is given by 100 × $[((1 + i_t)p_t/p_{t+1-1}$, where I is the nominal interest rate and p are consumer prices.

Country	Interest rate series used	IMF/IFS code
Argentina	Interbank	60B
Australia	Interbank	60B
Bolivia	Deposit	60L
Brazil	Interbank	60B
Canada	Interbank	60B
Chile	Deposit	60L
Colombia	Discount	60
Egypt	Discount	60
France	Interbank	60B
Germany	Interbank	60B
Greece	T-bill	60C
India	Interbank	60B
Indonesia	Interbank	60B
Israel	T-bill	60C
Ivory Coast	Discount	60
Japan	Interbank	60B
Kenya	T-bill	60C
Malaysia	Interbank	60B
Mexico	Interbank	60B
New Zealand	Interbank	60B
Nigeria	T-bill	60C
Norway	Interbank	60B
Pakistan	Interbank	60B
Peru	Discount	60
Philippines	T-bill	60C
Singapore	Interbank	60B
South Africa	Interbank	60B
South Korea	Interbank	60B
Spain	Interbank	60B
Sweden	Interbank	60B
Thailand	Interbank	60B
Uganda	T-bill	60C
United States	Federal funds	60B
Uruguay	Discount	60
Venezuela	Discount	60

APPENDIX 1: VOLATILITY OF SELECTED INDICATORS IN "LIMITED FLEXIBILITY AND FIXED" EXCHANGE RATE REGIMES

Country	Period	Probability that the monthly percent change is: Within a ±2.5 percent band: Exchange rate	Within a ±2.5 percent band: Reserves	Greater than ±4 percent: Nominal interest rate
	"Limited flexibility"			
France	March 1979–November 1999	97.5	54.9	0.8
Greece	January 1998–November 1999	80.0	31.3	0.0
Malaysia	January 1986–February 1990	98.1	35.9	3.9
Spain	June 1989–November 1999	92.4	64.7	0.0
Sweden	June 1985–October 1992	92.1	39.3	3.4
	"Fixed"			
Argentina	March 1991–November 1999	100.0	36.7	18.4
Bulgaria	June 1997–November 1999	93.1	48.2	3.57
Cote D'Ivoire	January 1970–November 1999	99.4	8.7	0.0
Estonia	June 1992–November 1999	100.0	32.6	5.7
Kenya	January 1970–September 1993	85.6	20.8	1.5
Lithuania	April 1994–November 1999	100.0	37.3	19.4
Malaysia	March 1990–November 1992	96.9	39.4	0.0
Nigeria	April 1993–November 1999	98.6	8.9	1.4
Norway	December 1978–November 1992	86.8	35.1	6.5
Singapore	January 1983–December 1987	96.6	83.3	0.0
Thailand	January 1970–June 1997	98.5	50.2	2.4

Recent pegs episodes with few monthly observations are Malaysia in September 1998 and Egypt in January 1999.

Source: *International Financial Statistics,* International Monetary Fund.

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