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**The Modern History of Exchange Rate Arrangements:
A Reinterpretation***

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We develop a novel system of reclassifying historical exchange rate regimes. One key difference between our study and previous classifications is that we employ monthly data on market-determined parallel exchange rates going back to 1946 for 153 countries. Our approach differs from the IMF official classification (which we show to be only a little better than random), it also differs radically from all previous attempts at historical reclassification. Our classification points to a rethinking of economic performance under alternative exchange rate regimes. Indeed, the breakup of Bretton Woods had less impact on exchange rate regimes than is popularly believed.

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<http://terpconnect.umd.edu/~creinhar/Papers.html>

I. INTRODUCTION

This paper rewrites the history of post-War exchange rate arrangements, based on an extensive new monthly data set spanning across 153 countries for 1946-2001. Our approach differs not only from countries' officially-declared classifications (which we show to be only a little better than random), it also differs radically from the small number of previous attempts at historical reclassification.¹

As a first innovation, we incorporate data on parallel and dual exchange rate markets, which have been enormously important not only in developing countries but in virtually all the European countries up until the late 1950s, and sometimes well beyond. We argue that any classification algorithm that fails to distinguish between unified rate systems (with one official exchange rate and no significant “black” or parallel market) and all others is fundamentally flawed. Indeed, in the vast majority of multiple exchange rate or dual systems, the floating dual or parallel rate is not only a far better barometer of monetary policy than is the official exchange rate, it is often the most economically meaningful rate.² Very frequently—roughly half the time for official pegs—we find that dual/parallel rates have been used as a form of “back door” floating, albeit one usually accompanied by exchange controls. The second novelty in our approach is that we develop extensive chronologies of the history of exchange arrangements and related factors, such as exchange controls

¹ The official classification is given in the IMF's *Annual Report on Exchange Rate Arrangements and Exchange Restrictions*, which, until recently, asked member states to self-declare their arrangement as belonging to one of four categories. Previous studies have either extended the four-way official classification into a more informative taxonomy (see Gosh et. al., [1997]), or relied largely on statistical methods to regroup country practices (see, Levy-Yeyati and Sturzenegger, [2002]). The Fund, recognizing the limitations of its former strategy, revised and upgraded the official approach toward classifying exchange rate arrangements in 1997 and again in 1999. Notably, all these prior approaches to exchange rate regime classification, whether or not they accept the country's declared regime, have been based solely on official exchange rates.

² When we refer to multiple exchange rates in this context, we are focusing on the cases where one or more of the rates is market-determined. This is very different from the cases where the multiple official rates are all fixed and simply act as a differential tax on a variety of transactions. Dual markets are typically legal, whereas parallel markets may or may not be legal.

and currency reforms. Together with a battery of descriptive statistics, this allows us to draw a nuanced distinction between what countries declare as their official *de jure* regime, and their actual *de facto* exchange rate practices. To capture the wide range of arrangements, our approach allows for fourteen categories of exchange rate regimes, ranging from no separate legal tender or a strict peg to a dysfunctional “freely falling” or “hyperfloat.”

Some highlights from our reclassification of exchange rate arrangements are as follows:

First, dual, or multiple rates, and parallel markets have prevailed far more frequently than is commonly acknowledged. In 1950, 45 percent of the countries in our sample had dual or multiple rates; many more had thriving parallel markets. Among the industrialized economies, dual or multiple rates were the norm in the 1940s and the 1950s and, in some cases, these lasted until much later. Our data lend strong support to the view stressed by Bordo [1993] that Bretton Woods encompassed two *very* different kinds of exchange rate arrangements in the pre- and post-convertibility periods and that the period of meaningful exchange rate stability was quite short-lived. In the developing world, such practices remained commonplace through the 1980s and 1990s and into the present.

We show that market-determined dual/parallel markets are important barometers of underlying monetary policy. This may be obvious in cases such as modern-day Myanmar where the parallel market premium at the beginning of 2003 exceeded 700 percent. As we show, however, the phenomenon is much more general, with the parallel market premium often serving as a reliable guide to the direction of future official exchange rate changes. Whereas dual/parallel markets have been marginal over some episodes, they have been economically important in others, and there are many instances where only a few transactions take place at the official rate. To assess the importance of secondary (legal or illegal) parallel markets, we collected data that allow us to estimate export misinvoicing practices, in many cases going back to 1948. These estimates show that leakages from the official market were significant in many of the episodes when there were dual or parallel markets.

Second, when one uses market-determined rates in place of official rates, the history of exchange rate policy begins to look very different. For example, it becomes obvious that de facto floating was common during the early years of the Bretton Woods era of “pegged” exchange rates. Conversely, many “floats” of the post-1980s turn out to be (de facto) pegs, crawling pegs, or very narrow bands. Of countries listed in the official IMF classification as managed floating, 53 percent turned out to have de facto pegs, crawls or narrow bands to some anchor currency.

Third, next to pegs (which account for 33 percent of the observations during 1970-2001 (according to our new “Natural” classification), the most popular exchange rate regime over modern history has been the crawling peg, which accounted for over 26 percent of the observations. During 1990 to 2001, this was the most common type of arrangement in emerging Asia and Western Hemisphere (excluding Canada and the United States), making up for about 36 and 42 percent of the observations, respectively.

Fourth, our taxonomy introduces a new category: freely falling, or the cases where the 12-month inflation rate is equal to or exceeds 40 percent per annum.³ It turns out to be a crowded category indeed, with about 12½ percent of the observations in our sample occurring in the freely falling category. As a result, “freely falling” is about three times as common as “freely floating,” which accounts for only 4½ percent of the total observations. (In the official classification, freely floating accounts for over 30 percent of observations over the past decade). Our new freely falling classification makes up 22 and 37 percent of the observations, respectively, in Africa and Western Hemisphere (excluding Canada and the United States) during 1970-2001. In the 1990s, freely falling accounted for 41 percent of the observations for the transition economies. Given the distortions associated with very high inflation, any fixed versus flexible exchange rate regime comparisons that do not break out the freely falling episodes are meaningless, as we shall confirm.

³ We also include in the freely falling category the first six months following an exchange rate crisis (see Appendix 1 for details), but only for those cases where the crisis marked a transition from a peg or quasi-peg to a managed or independent float.

There are many important reasons to seek a better approach to classifying exchange rate regimes. Certainly one is the recognition that contemporary thinking on the costs and benefits of alternative exchange rate arrangements has been profoundly influenced by the large number of studies on the empirical differences in growth, trade, inflation, business cycles, and commodity price behavior. Most have been based on the official classifications and all on official exchange rates. In light of the new evidence we collect, we conjecture that the influential results in Baxter and Stockman [1989]—that there are no significant differences in business cycles across exchange arrangements—may owe to the fact that the official historical groupings of exchange rate arrangements are misleading.

The paper proceeds as follows. In the next section, we present evidence to establish the incidence and importance of dual or multiple exchange rate practices. In Section III, we sketch our methodology for re-classifying exchange rate arrangements. Section IV addresses some of the possible critiques to our approach, compares our results to the “official history,” and provides examples of how our reclassification may reshape evidence on the links between exchange rate arrangements and various facets of economic activity. The final section reiterates some of the main findings, while background material to this paper provides the detailed country chronologies that underpin our analysis.

II. THE INCIDENCE AND IMPORTANCE OF DUAL AND MULTIPLE EXCHANGE RATE ARRANGEMENTS

In this section, we document the incidence of dual or parallel markets (legal or otherwise) and multiple exchange rate practices during post World War II. We then present evidence that the market-determined exchange rate is a better indicator of the underlying monetary policy than the official exchange rate. Finally, to provide a sense of the quantitative importance for economic activity of the dual or parallel market, we present estimates of “leakages” from the official market. Specifically, we provide quantitative measures of export misinvoicing practices.

We primarily use monthly data on official and market-determined exchange rates for the period 1946-2002. In some instances, the data for the market-determined rate is only available for a shorter period and the background material provides the particulars on a country-by-country basis. The pre-1999 market-determined exchange rate data comes from various issues of *Pick's Currency Yearbook*, *Pick's Black Market Yearbooks*, and *World Currency Report*, and the official rate comes from the same sources and as well as the IMF. The quotes are end of month exchange rates and are not subject to revisions. For the recent period (1999-2002), the monthly data on market-determined exchange rates comes from the original country sources (i.e., the central banks), for those countries where there are active parallel markets for which data is available.⁴ Since our coverage spans more than 50 years, it encompasses numerous cases of monetary reforms involving changes in the units of account, so the data was spliced accordingly to ensure continuity.

II.A. On the Popularity of Dual and Multiple Exchange Rate Practices

Figure I illustrates de facto and de jure non-unified exchange rate regimes. The figure shows the incidence of exchange rate arrangements over 1950-2001, with and without stripping out cases of dual markets or multiple exchange rates. The IMF classification has been simplified into what it was back in the days of Bretton Woods—namely, Pegs and Other.⁵ The dark portion of the bars represent cases with unified exchange rates and the lightly shaded portion of each bar separates out the dual, multiple or parallel cases. In 1950, more than half (53 percent) of all arrangements involved two or more exchange rates. Indeed, the heyday of multiple exchange rate practices and active parallel markets was 1946-1958, before the restoration of convertibility in Europe. Note also, that according to the official IMF classification, pegs reigned supreme in the

⁴ These countries include: Afghanistan, Angola, Argentina, Belarus, Belize, Bolivia, Burundi, Congo (DCR), Dominican Republic, Egypt, Ghana, Iran, Libya, Macedonia, Mauritania, Myanmar, Nigeria, Pakistan, Rwanda, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, Yemen, Yugoslavia, and Zimbabwe.

⁵ For a history of the evolution of the IMF's classification strategy, see the working paper version of this paper, Reinhart and Rogoff [2002].

early 1970s, accounting for over 90 percent of all exchange rate arrangements. In fact, *over half* of these “pegs” masked parallel markets that, as we shall show, often exhibited quite a different behavior.

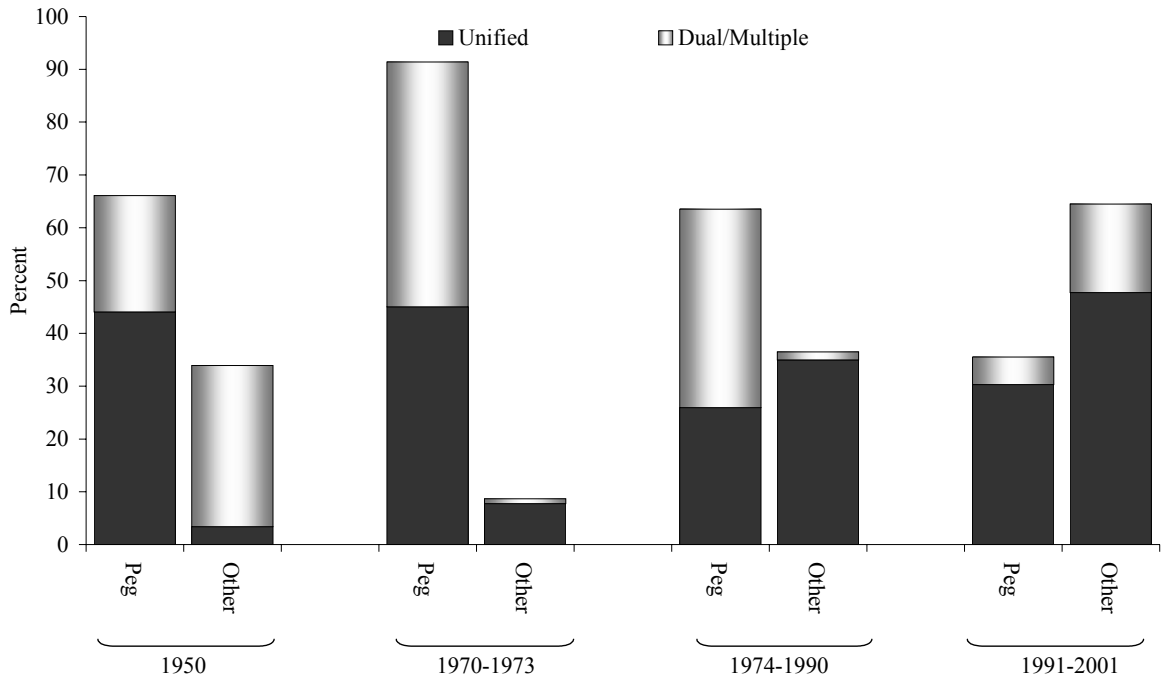


FIGURE I
The Incidence of Dual or Multiple Exchange Rate Arrangements,
1950-2001: Simplified IMF Classification

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

Note: Exchange rate arrangements classified as “Other” includes the IMF’s categories of limited flexibility, managed floating, and independently floating.

II.B. The Market-determined Exchange Rate as an Indicator of Monetary Policy

While the quality of data on market-determined rates is likely to vary across countries and time, we nevertheless believe these data to be generally far better barometers of the underlying monetary policy than are official exchange rates. For instance, if the laxity in monetary policy is not consistent with maintaining a fixed official exchange rate, one would expect that the market-determined rate starts depreciating ahead of the inevitable devaluation of the official rate. When the official realignment occurs—it is simply a validation of what had previously transpired in the free market. Indeed, this is the pattern shown in the three panels of Figure 2 for the cases of Bolivia, Indonesia, and Iran—many more such cases are displayed in the figures that accompany the 153 country chronologies.⁶ This pattern also emerges often in the developed European economies and Japan in the years following World War II.

To illustrate more rigorously that the market-based exchange rate is a better indicator of the monetary policy stance than the official rate, we performed two exercises for each country. First, we examined whether the market determined-exchange rate systematically predicts realignments in the official rate, as suggested in Figure II. To do so, we regressed a currency crash dummy on the parallel market premium lagged one to six months, for each of the developing countries in our sample.⁷ If the market exchange rate consistently anticipates devaluations of the official rate, its coefficient should be positive and statistically significant. If, in turn, the official exchange rate does not validate the market rate, then the coefficient on the lagged market exchange rate will be negative or simply not significant. Table I summarizes the results of the country-by-country time series probit regressions. In the overwhelming number of cases (97 percent), the coefficient on the market-

⁶ See “Part I. The Country Chronologies and Chartbook, Background Material to A Modern History of Exchange Rate Arrangements: A Reinterpretation” at <http://www.puaf.umd.edu/faculty/papers/reinhart/reinhart.htm>.

⁷ Two definitions of currency crashes are used. A severe currency crash refers to a 25 percent or higher monthly depreciation which is at least 10 percent higher than the previous month’s depreciation. The “milder” version represents a 12.5 percent monthly depreciation which is at least 10 percent above the preceding month’s depreciation; see details in Appendix 1.

determined exchange rate is positive. In about 81 percent of the cases, the sign on the coefficient was positive and statistically significant. Indeed, for Western Hemisphere as a region, the coefficient on the parallel premium was significant for all the countries in our sample. These findings are in line with those of Bahmani-Oskooee, Miteza, and Nasir, [2002], who use panel annual data for 1973-1990 for 49 countries and employ a completely different approach. Their panel cointegration tests indicate that the official rate will systematically adjust to the market rate in the long run.

TABLE I
Is the Parallel Market Rate a Good Predictor of Crashes in the Official Exchange Rate?
Summary of the Probit Country-by-Country Estimation

Regression, $D_{O_t} = \alpha + \beta \Delta P_{t-i} + u_t$	“Mild” crash
Percent of countries for which:	
$\beta > 0$	97.1
$\beta > 0$ and significant ^a	81.4
$\beta < 0$	2.9
$\beta < 0$ and significant ^a	1.4

Sources: *Pick’s Currency Yearbook*, *World Currency Report*, *Pick’s Black Market Yearbook*, and the authors’ calculations.

Notes: D_{O_t} is a dummy variable that takes on the value of 1 when there is a realignment in the official exchange rate along the lines described below and 0 otherwise, α and β are the intercept and slope coefficients, respectively (our null hypothesis is $\beta > 0$), ΔP_{t-i} is the 12-month change in the parallel exchange rate, lagged one to six months (the lags were allowed to vary country by country, as there was no prior reason to restrict dynamics to be the same for all countries) and u_t is a random disturbance.

Two definitions of currency crashes are used in the spirit of Frankel and Rose (1996). A “severe” currency crash refers to a 25 percent or higher monthly depreciation, which is at least 10 percent higher than the previous month’s depreciation. The “mild” version represents a 12.5 percent monthly depreciation, which is at least 10 percent above the preceding month’s depreciation. Since both definitions of crash yield similar results, we report here only those for the more inclusive definition. The regression sample varies by country and is determined by data availability.

^a At the ten percent confidence level or higher.

Secondly, we calculated pairwise correlations between inflation (measured as the 12-month change in the consumer price index) and the 12-month percent change in the official and market exchange rates, six months earlier. If the market rate is a better pulse of monetary policy, it should be

(a priori) more closely correlated with inflation. As shown in Table II, we find that for the majority of cases (about $\frac{3}{4}$ of the countries) the changes in market-determined exchange rates have higher correlations with inflation than do changes in the official rate.⁸ An interesting exception to this pattern of higher correlations between the market determined exchange rate changes and inflation is for the industrial countries in the “Convertible Bretton Woods” period (1959-1973), an issue that merits further study.

TABLE II
Inflation, Official and Market Determined Exchange Rates:
Country-by-Country Pairwise Correlations

Percent of countries for which the correlations of :	
The market-determined exchange rate and inflation are higher than the correlations of the official rate and inflation	73.7
The market-determined exchange rate and inflation are lower than the correlations of the official rate and inflation	26.3

Sources: International Monetary Fund, *International Financial Statistics*, *Pick's Currency Yearbook*, *World Currency Report*, *Pick's Black Market Yearbook*, and the authors' calculations.

Notes: The correlations reported are those of the 12-month percent change in the consumer price index with the 12-month percent change in the relevant bilateral exchange rate lagged six months.

⁸ Note that, due to data limitations, we use official prices rather than black market or “street” prices to measure inflation here. Otherwise, the dominance of the market-determined rates in this exercise would presumably be even more pronounced.

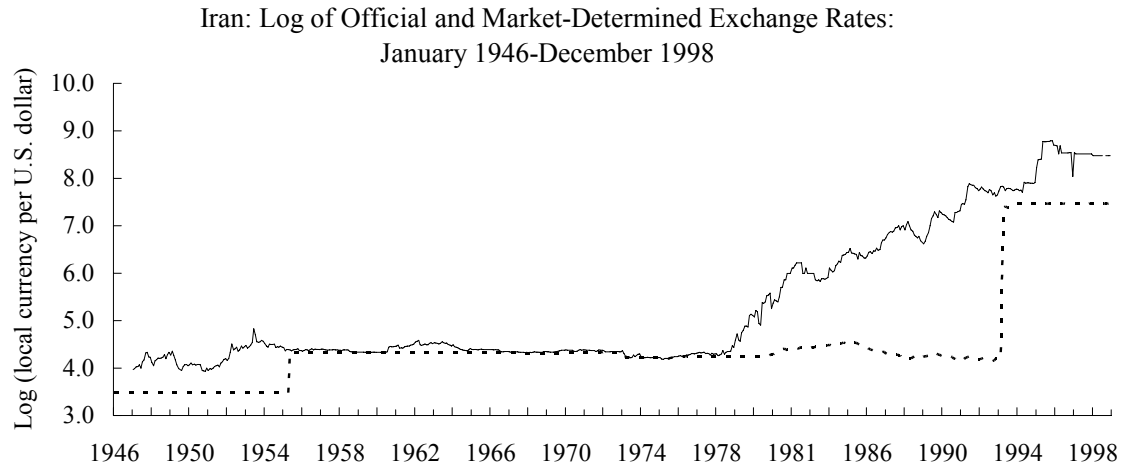
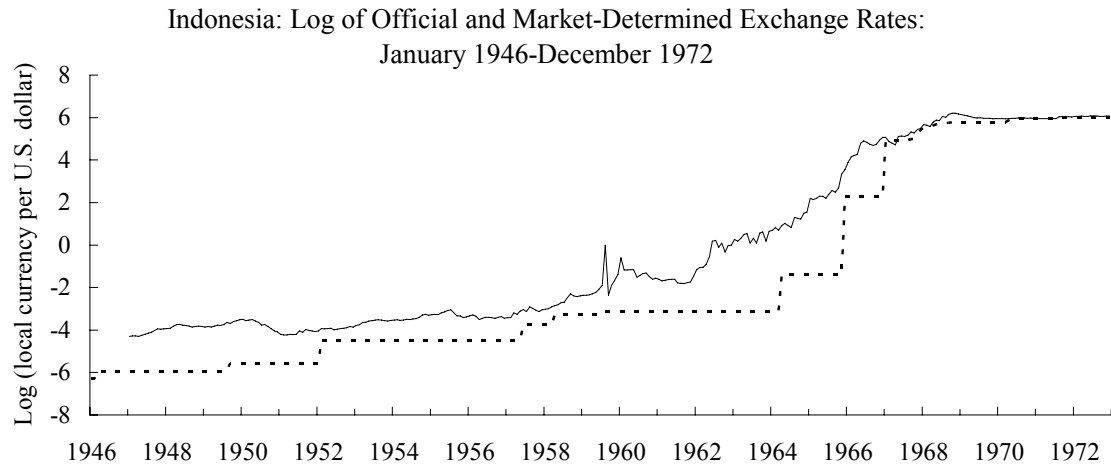
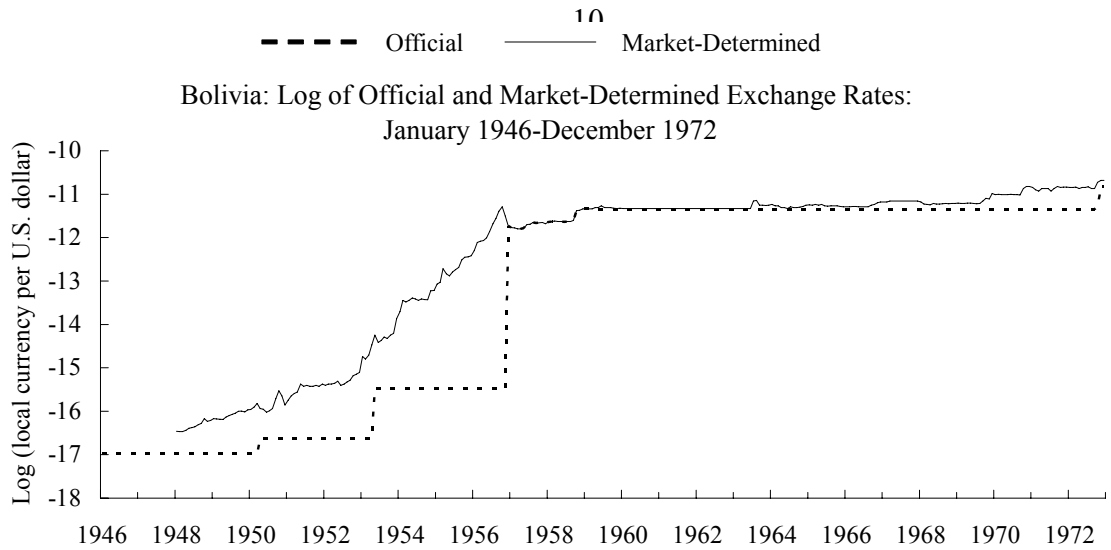


FIGURE II
Official Exchange Rates Typically Validate the Changes in The Market Rates

Sources: Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

II.C. How Important Are Parallel Markets?

There are cases where the parallel (or secondary) exchange rate applies only to a few limited transactions. An example is the “switch pound” in the United Kingdom during September 1950 through April 1967.⁹ However, it is not unusual for dual or parallel markets (legal or otherwise) to account for the lion’s share of transactions with the official rate being little more than symbolic. As Kiguel, Lizondo, and O’Connell [1997] note, the official rate typically diminishes in importance when the gap between the official and market-determined rate widens.

To provide a sense of the comparative relevance of the dual or parallel market we proceed along two complimentary dimensions. First, we include a qualitative description in the country-specific chronologies (see background material) of what transactions take place in the official market versus the secondary market. Second, we develop a quantitative measure of the potential size of the leakages into dual or parallel exchange markets.¹⁰ Following Ghei, Kiguel and O’Connell [1997], we classify episodes where there are dual/parallel markets into three tiers according to the level (in percent) of the parallel market premium: low (below 10 percent), moderate (10 percent or above but below 50), and high (50 percent and above). For the episodes of dual/parallel markets, we provide information about which category each episode falls in (by calculating the average premium for the duration of the episode). In addition to the information contained in the premium, we constructed an extensive database on export misinvoicing, or the difference between what a country reports as its exports and what other countries report as imports from that country, adjusted for shipping costs. Historically, there are tight links between capital flight, export underinvoicing, and the parallel

⁹ For example, while the United Kingdom officially had dual rates through April 1967, the secondary rate was so trivial (both in terms of the premium and the volume of transactions it applied to) that it is classified as a peg in our classification scheme (see background material.) In the next section, we describe how our classification algorithm deals with these cases.

¹⁰ For instance, according to Claessens [1997], export underinvoicing hit a historic high in Mexico during 1982—the crisis year in which the dual market was introduced. Similar statements can be made about other crisis episodes that involved the introduction of exchange controls and the segmentation of markets.

market premium.¹¹ As with the parallel market premium, we divide the export misinvoicing estimates into three categories (as a percent of the value of total exports): low (less than 10 percent of exports), moderate (10 to 15 percent of exports), and high (above 15 percent). For Europe, Japan, and the United States, misinvoicing calculations start in 1948 while for the remaining countries these start in 1970. In the extensive background material to this paper we show, for each episode, which of the three categories is applicable. Finally, we construct a score (1 for Low, 2 for Moderate, and 3 for High) for both of these proxies for leakages. The combined score on the estimated size of the leakages (these range from 2 to 6) is also reported.¹²

Table III, which shows the evolution of export misinvoicing (as a percent of the value of total exports) and the parallel market premium (in percent) across regions and through time, provides a general flavor of the size of potential leakages from the official market. According to our estimates of misinvoicing (top panel), the regional patterns show the largest leakages for the Caribbean and non-CFA Sub-Saharan Africa 1970-2001, with averages in the 30 to 50 percent range. The lowest estimates of misinvoicing (8 to 11 percent) are for Western Europe, North America, and the CFA Franc Zone. It is also noteworthy that, although low by the standards of other regions, the export misinvoicing average in 1970-2001 for Western Europe is half of what it was in 1948-1949. Yet these regional averages may understate the importance of misinvoicing in some countries. For example, the maximum value for 1948-2001 for Western Europe (16.9 percent) does not reflect the fact that for Spain misinvoicing as a percent of the value of exports amounted to 36 percent in 1950, a comparable value to what we see in some of the developing regions.

As to the regional average parallel market premium shown in the bottom panel of Table III, all regions fall squarely in the Moderate-to-High range (with the exception of North America,

¹¹ See Kiguel, Lizondo, and O'Connell [1997] and the references contained therein.

¹² See "Part II. Parallel Markets and Dual and Multiple Exchange Rate Practices: Background Material to A Modern History of Exchange Rate Arrangements: A Reinterpretation" at <http://www.puaf.umd.edu/faculty/papers/reinhart/reinhart.htm>.

TABLE III
Leakages: Export Misinvoicing and the Parallel Market Premium
Absolute Value of Export Misinvoicing
(as a percent of the value of exports)

	Descriptive Statistics			Mean Absolute Value (by decade)						
	Min.	Max.	St. Dev	48-49	50-59	60-69	70-79	80-89	90-01	70-01
World	7.0	39.8	8.4	12.8	10.9	9.9	24.7	22.1	26.0	24.4
North Africa	2.5	59.9	10.3	...	...	...	7.2	8.3	16.1	10.9
CFA	12.6	48.3	8.4	...	...	...	28.5	21.7	21.5	23.8
Rest of Africa	16.3	201.9	33.5	...	...	...	23.4	23.4	53.6	34.1
Middle East and Turkey	9.1	45.4	9.6	...	...	...	30.7	16.7	17.4	21.5
Developing Asia and Pacific	9.5	79.1	16.9	..	...	...	31.4	14.9	24.1	23.5
Industrialized Asia	3.7	18.2	3.3	11.2	14.2	13.9	14.6	12.0	10.3	12.2
Caribbean	9.7	136.0	33.2	...	...	...	30.8	48.9	60.0	47.0
Central and South America	12.0	49.6	8.2	...	...	...	26.1	36.0	30.4	30.8
Central and Eastern Europe	2.5	50.0	18.3	...	...	...	46.6	15.4	7.4	22.1
Western Europe	2.4	16.9	3.0	14.1	10.4	10.0	11.6	7.6	7.7	8.9
North America	0.6	22.6	5.9	4.6	9.4	3.8	16.0	11.4	4.8	10.4

Monthly Average Parallel Market Premium
(excluding freely falling episodes, in percent)

	Descriptive Statistics			Average (by decade)						
	Min.	Max.	St. Dev	46-49	50-59	60-69	70-79	80-89	90-98	46-98
World	11.6	205.9	35.4	137.8	56.7	38.1	31.3	57.8	52.6	54.1
North Africa	-1.2	164.8	41.4	...	9.9	35.7	30.7	108.6	62.0	53.6
CFA	-6.4	12.7	2.7	..	...	...	0.0	1.2	1.8	0.9
Rest of Africa	1.7	322.5	73.9	31.9	6.9	33.7	113.7	112.7	107.7	71.0
Middle East and Turkey	5.1	493.1	99.6	54.6	81.0	26.0	21.4	146.5	193.2	88.6
Developing Asia & Pacific	-3.7	660.1	95.0	143.5	60.9	168.9	44.7	43.1	12.1	72.9
Industrialized Asia	-6.9	815.9	107.6	324.4	43.0	12.0	3.6	1.3	1.5	36.1
Caribbean	-23.8	300.0	42.8	...	...	29.6	30.2	56.8	53.6	42.3
Central and South America	3.0	716.1	78.5	49.1	133.0	16.4	18.6	74.8	8.4	51.0
Western Europe	-5.6	347.5	48.6	165.5	17.0	1.2	2.0	1.7	1.2	16.9
North America	-4.3	49.7	3.3	7.2	0.5	0.0	1.1	1.4	1.6	1.3

Sources: International Monetary Fund, *Direction of Trade Statistics*, *International Financial Statistics*, *Pick's Currency Yearbook*, *World Currency Report*, *Pick's Black Market Yearbook*, and authors' calculations.

Notes: To calculate export misinvoicing, let X_{wi} = imports from country i , as reported by the rest of the world (CIF basis), X_i = exports to the world as reported by country i , Z = imports CIF basis/imports COB basis, then export misinvoicing = $(X_{wi} / Z) - X_i$. The averages are reported are absolute values as a percent of the value of total exports. The parallel premium is defined as $100 \times [(P-O)/O]$, where P and O are the parallel and official rates, respectively. The averages for the parallel premium are calculated for all the countries in our sample in each region, as such, it includes countries where rates are unified and the premium is zero or nil.

Western Europe, and CFA Africa). In the case of developing Asia, the averages are significantly raised by Myanmar and Laos. It is worth noting the averages for Europe and industrialized Asia in the 1940s are comparable and even higher than those recorded for many developing countries, highlighting the importance of acknowledging and accounting for dual markets during this period.

To sum, in this section we have presented evidence that leads us to conclude that parallel markets were both important as indicators of monetary policy and as representative of the prices underlying an important share of economic transactions. It is therefore quite reasonable to draw heavily on the dual or parallel market data in classifying exchange rate regimes, the task to which we now turn.

III. THE “NATURAL” CLASSIFICATION CODE: A GUIDE

We would describe our classification scheme as a “Natural” system that relies on a broad variety of descriptive statistics and chronologies to group episodes into a much finer grid of regimes, rather than the three or four buckets of other recent classification strategies.¹³ The two most important new pieces of information we bring to bear is our extensive data on market-determined dual or parallel exchange rates and detailed country chronologies. The data, its sources, and country coverage is described along with the chronologies that map the history of exchange rate arrangements for each country in the detailed background material to this paper. To verify and classify regimes, we also rely on a variety of descriptive statistics based on exchange rate and inflation data from 1946 onwards; Appendix 1 describes these.

III.A. The Algorithm

Figure III is a schematic summarizing our Natural Classification algorithm. *First*, we use the chronologies to sort out for separate treatment countries with either official dual or multiple rates or

¹³ In biology, a natural taxonomic scheme relies on the characteristics of a species to group them.

active parallel (black) markets.¹⁴ *Second*, if there is no dual or parallel market, we check to see if there is an official pre-announced arrangement, such as a peg or band. If there is, we examine summary statistics to verify the announced regime, going forward from the date of the announcement. If the regime is verified (i.e., exchange rate behavior accords with the pre-announced policy), it is then classified accordingly as a peg, crawling peg, etc. If the announcement fails verification (by far the most common outcome), we then seek a de facto statistical classification using the algorithm described below, and discussed in greater detail in Appendix 1.

Third, if there is no pre-announced path for the exchange rate, or if the announced regime cannot be verified by the data and the 12-month rate of inflation is below 40 percent, we classify the regime by evaluating exchange rate behavior. As regards which exchange rate is used, we consider a variety of potential anchor currencies including: the US dollar, DM, euro, French franc, UK pound, yen, Australian dollar, Italian lira, SDR, South African rand, and the Indian rupee. A reading of the country chronologies makes plain that the relevant anchor currency varies not only across countries but sometimes within a country over time. (For example, many former British colonies switched from pegging to the UK pound to pegging to the US dollar.)

Our volatility measure is based on a five-year moving window (see Appendix 1 for details), so that the monthly exchange rate behavior may be viewed as part of a larger, continuous, regime.¹⁵ We also examined the graphical evidence as a check on the classification. In practice, the main

¹⁴ See background material posted at <http://www.puaf.umd.edu/faculty/papers/reinhart/reinhart.htm>

¹⁵ If the classification is based on exchange rate behavior in a particular year, it is more likely that one-time events (such as a one-time devaluation and re-peg) or an economic or political shock leads to labeling the year as a change in regime, when in effect there is no change. For example, Levy-Yeyati and Sturzenegger [2002], who classify regimes one year at a time (with no memory), classified all CFA zone countries as having an intermediate regime in 1994, when these countries had a one-time devaluation in January of that year. Our algorithm classifies them as having pegs throughout. The five-year window also makes it less likely that we classify as a peg an exchange rate that did not move simply because it was a tranquil year with no economic or political shocks. It is far less probable that there are no shocks over a five-year span. .

reason for doing so is to separate pegs from crawling pegs or bands and to sort the latter into crawling and non-crawling bands.

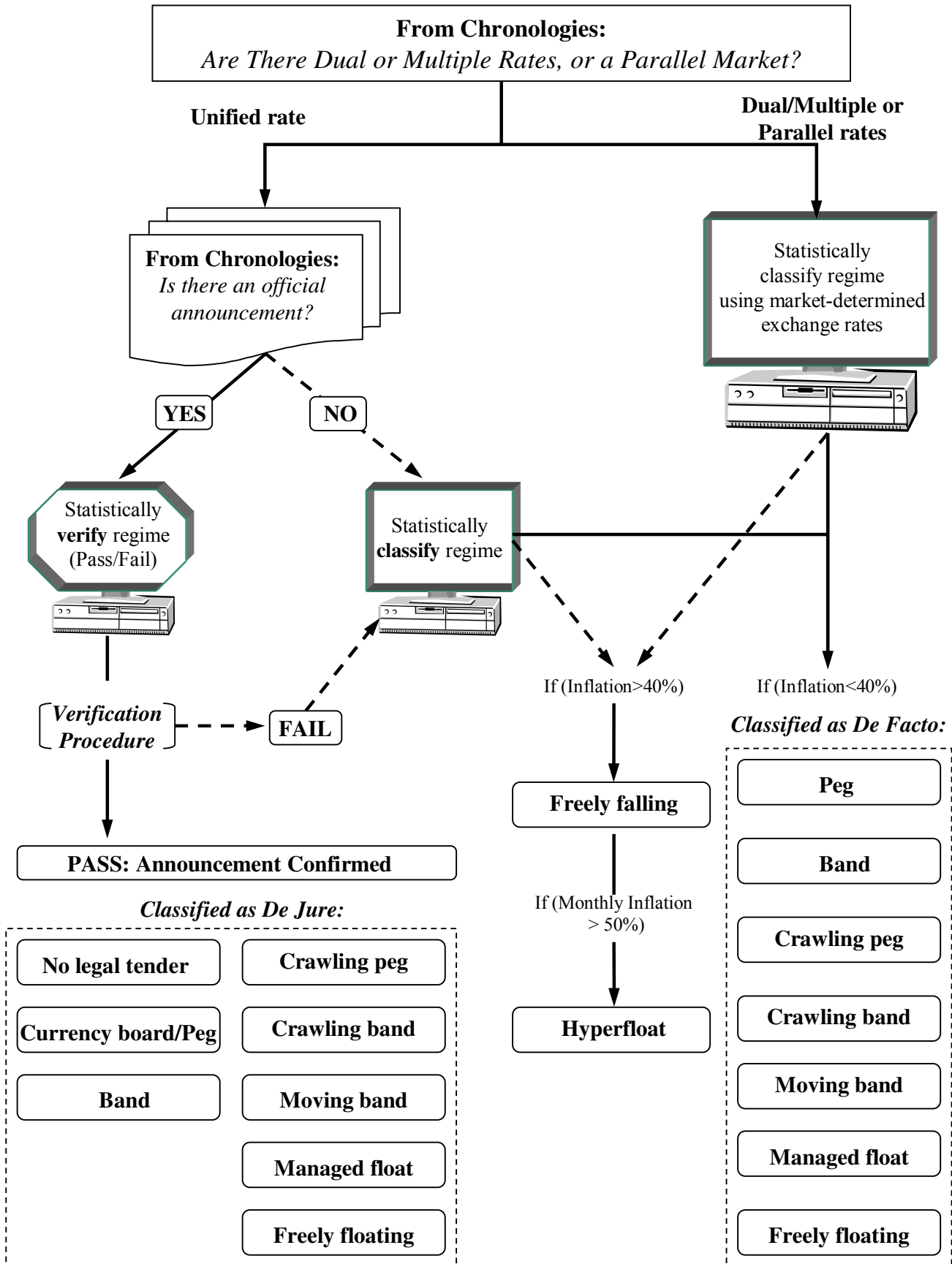


FIGURE III
A Natural Exchange Rate Classification Algorithm

Fourth, as we have already stressed, a straightforward but fundamental departure from all previous classification schemes is that we create a new separate category for countries whose twelve-month rate of inflation is above 40 percent. These cases are labeled “freely falling.”¹⁶ If the country is in a hyperinflation (according to the classic Cagan [1956] definition of 50 percent or more *monthly* inflation), we categorize the exchange rate regime as a “hyperfloat,” a sub-species of freely falling. In Figure IV, bilateral exchange rates versus the US dollar are plotted for two countries that have been classified by the IMF (and all previous classification efforts) as floating over much of the postwar period—Canada and Argentina.¹⁷ To us, lumping the Canadian float with that of Argentina during its hyperinflation seems, at a minimum, misleading. As Figure IV illustrates, floating regimes look rather different from freely falling regimes—witness the orders of magnitude difference in the scales between Canada (top of page) and Argentina (bottom). This difference is highlighted in the middle panel, which plots the Canadian dollar-US dollar exchange rate against Argentina’s scale; from this perspective, it looks like a fixed rate! The exchange rate histories of other countries that experienced chronic high inflation bouts—even if these did not reach the hyperinflation stage—look more similar to Argentina in Figure IV than to Canada.¹⁸ In our view, regimes associated with an utter lack of monetary control and the attendant very high inflation should not be automatically lumped under the same exchange rate arrangement as low inflation floating regimes. On these grounds, freely falling needs to be treated as a separate category, much in the same way that Highly Indebted Poorest Countries (HIPC) are treated as a separate “type” of debtor.

¹⁶ In the exceptional cases (usually the beginning of an inflation stabilization plan) where, despite inflation over 40 percent, the market rate nevertheless follows a confirmed, pre-announced band or crawl, the pre-announced regime takes precedence.

¹⁷ For Argentina, this of course, refers to the period before the Convertibility Plan is introduced in April 1991 and for Canada the post-1962 period.

¹⁸ Two-panel figures, such as that shown for Chile (Figure V), for each country in the sample are found in the background material alongside the country-specific chronologies.

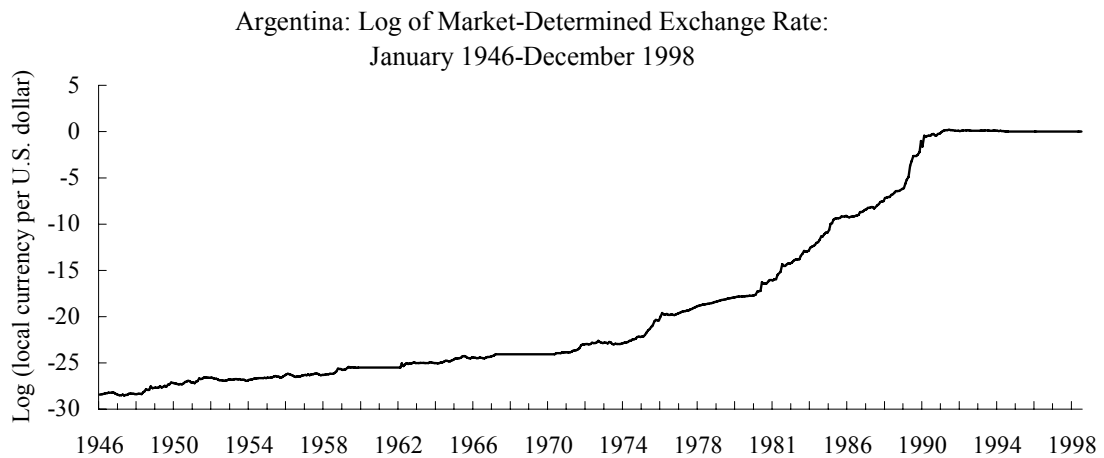
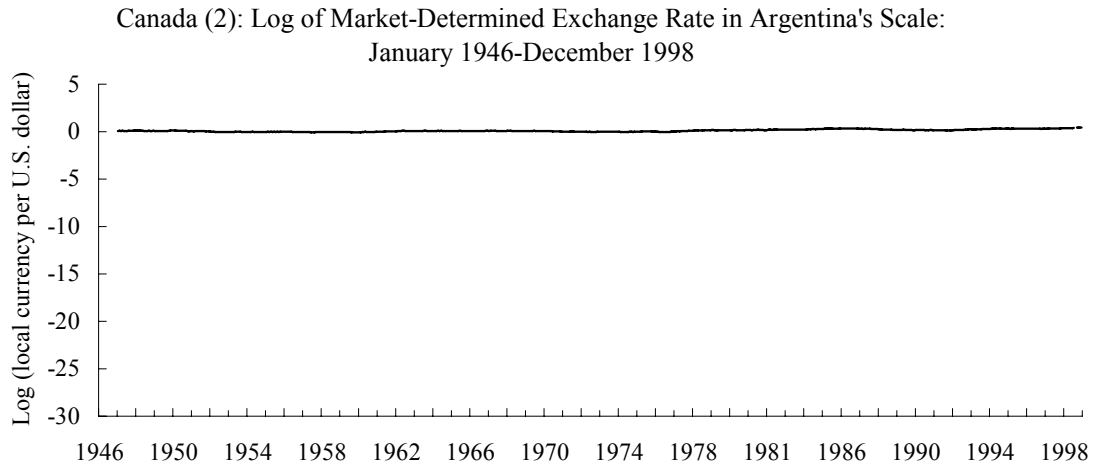
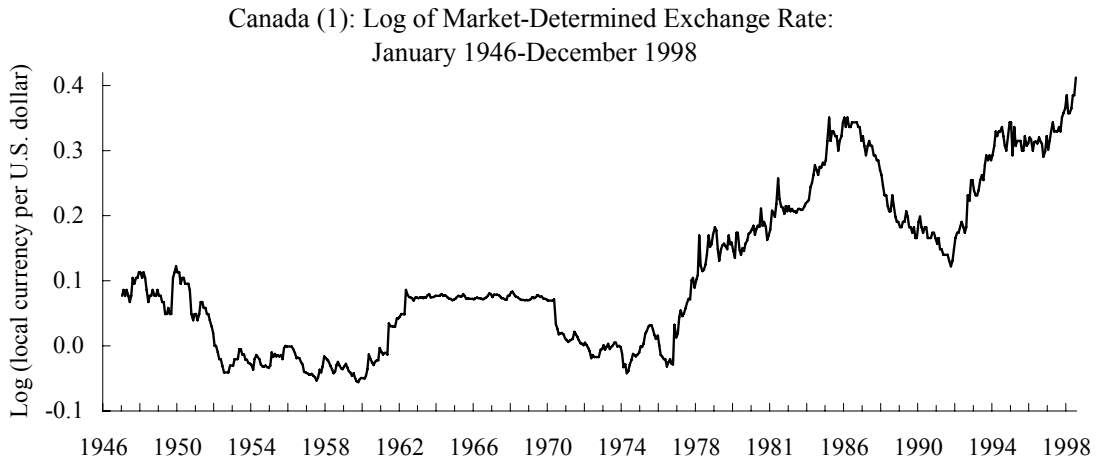


FIGURE IV
The Essential Distinction Between Freely Floating and Falling

Sources: Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

In step five, we take up those residual regimes that were not classified in steps one through four. These regimes become candidates for “managed” or “freely” floating.¹⁹ To distinguish between the two, we perform some simple tests (see Appendix 1) that look at the likelihood the exchange rate will move within a narrow range, as well as the mean absolute value of exchange rate changes. When there are dual or parallel markets and the parallel market premium is consistently 10 percent or higher, we apply steps one through five to our data on parallel exchange rates and reclassify accordingly, though in our finer grid.²⁰

III.B. Using the Chronologies

The 153 individual country chronologies are also a central point of departure from all previous efforts to classify regimes. In the first instance, the data are constructed by culling information from annual issues of various secondary sources, including *Pick’s Currency Yearbook*, *World Currency Report*, *Pick’s Black Market Yearbook*, *International Financial Statistics*, the IMF’s *Annual Report on Exchange Rate Arrangements and Exchange Restrictions*, and the *United Nations Yearbook*. Constructing our data set required us to sort and interpret information for every year from every publication above. Importantly, we draw on national sources to investigate apparent data errors or inconsistencies. More generally, we rely on the broader economics literature to include pertinent information, such as the distribution of transactions among official and parallel markets.²¹

The chronologies allow us to date dual or multiple exchange rate episodes, as well as to differentiate between pre-announced pegs, crawling pegs, and bands from their de facto counterparts. We think it is important to distinguish between say, de facto pegs or bands from announced pegs or

¹⁹ Our classification of “freely floating” is the analogue of “independently floating” in the official classification.

²⁰ When the parallel market premium is consistently (i.e., all observations within the five-year window) in single digits, we find that in nearly all these cases the official and parallel rate yield the same classification.

²¹ See Marion [1994], for instance.

bands, because their properties are potentially different.²² At the very least, we want to provide future researchers with the data needed to ask a variety of questions about the role of exchange rate arrangements. The chronologies also flag the dates for important turning points, such as when the exchange rate first floated, or when the anchor currency was changed.

Table IV gives an example of one of our 153 chronologies (see background material) for the case of Chile. The first column gives critical dates. Note that we extend our chronologies as far back as possible (even though we can only classify from 1946 onwards); in the case of Chile we go back to 1932.

The second column lists how the arrangement is classified. *Primary* classification refers to the classification *according to our Natural algorithm*, which may or may not correspond to the official IMF classification (shown in parentheses in the second column of Table IV). *Secondary* and *tertiary* classifications are meant only to provide *supplemental* information, as appropriate. So, for example, from November 1952 until April 1956 Chile's inflation was above 40 percent and, hence, its primary classification is freely falling—that is the only classification that matters for the purposes of the Natural algorithm. For those interested in additional detail, however, we also note in that column that the market determined exchange rate was a managed float along the lines described in detail in Appendix 1 (secondary) and that, furthermore, Chile had multiple exchange rates (tertiary). This additional information may be useful, for example, for researchers who are not interested in treating the high inflation cases separately (as we have done here). In this case, they would have sufficient information to place Chile in the 1952-1956 period in the managed float category. Alternatively, for those researchers that wish to treat dual or multiple exchange rate practices as a separate category altogether (say, because these arrangements usually involve capital controls), the second column

²² Policymakers may not be indifferent between the two. In theory, at least, announcements of pegs, bands, and so on can act as a coordinating device which, by virtue of being more transparent, could invite speculative attacks.

(under secondary or tertiary classification) provides the relevant information to do that sorting accordingly.

As one can see, although Chile unified rates on September 1999, it previously had some form of dual or multiple rates throughout most of its history. In these circumstances, we reiterate that our classification algorithm relies on the market-determined, rather than the official exchange rate.²³ Over some periods the discrepancy between the official and parallel rate, however, proved to be small. For example, from January 1992 onwards the parallel market premium remained in single digits and our algorithm shows that it makes little difference whether the official or parallel rate is used. In these instances, we leave the notation in the second column that there are dual rates (for information purposes), but also note in the third column that the premium is in single digits. As noted, Chile has also experienced several periods where the twelve-month monthly inflation exceeded 40 percent. Our algorithm automatically categorizes these as freely falling exchange rate regimes—*unless* there is a *pre-announced* peg crawling peg or narrow band that is verified, as was the case when the Tablita program was introduced on February 1978.

The third column in our chronology gives further sundry information on the regime—e.g., the width of the announced and de facto bands, etc. For Chile, which followed a crawling band policy over many sub-periods, it is particularly interesting to note the changes over time in the width of the bands. The third column also includes information about developments in the parallel market premium and currency reform. As an example of the former, we note that since 1992 the parallel premium slipped into single digits; an example of the latter is given for Chile when the peso replaced the escudo in 1975.

The top panel of Figure V plots the path of the official and market-determined exchange rate for Chile from 1946. It is evident that through much of the period shown the arrangement was one of

²³ The other Chronologies do not contain this information, but the annual official IMF classification for the countries in the sample is posted at <http://www.puaf.umd.edu/faculty/papers/reinhart/reinhart.htm>.

TABLE IV
A Sample Chronology in the Natural Classification Scheme: Chile, 1932-2001

Date	Classification Primary/Secondary/Tertiary (official IMF classification in parentheses)	Comments
September 16, 1925- April 20, 1932	Peg	Gold standard. Foreign exchange controls are introduced on July 30, 1931.
April 20, 1932-1937	Dual Market	Pound Sterling is reference currency. Suspension of gold standard.
1937-February 1946	Managed floating/Multiple rates	US dollar becomes the reference currency
March 1946-May 1947	Freely falling/Managed floating/Multiple rates	
June 1947-October 1952	Managed floating/Multiple rates	
November 1952-April 16, 1956	Freely falling/Managed floating/Multiple rates	
April 16, 1956-August 1957	Freely falling/Managed floating/Dual Market	Rate structure is simplified and a dual market is created.
September 1957-June 1958	Managed floating/Dual Market	
July 1958-January 1, 1960	Freely falling/Managed floating/Dual Market	
January 1, 1960-January 15, 1962	Peg to US dollar	The escudo replaces the peso.
January 15, 1962-November 1964	Freely falling/Managed floating/Multiple rates	Freely falling since April 1962.
December 1964-June 1971	Managed floating/Multiple rates (Peg)	
July 1971-June 29, 1976	Freely falling/Multiple exchange rates (Peg through 1973-managed floating afterwards)	On September 29, 1975 the peso replaced the escudo. October 1973 classifies as a hyperfloat.
June 29, 1976-January 1978	Freely falling/Crawling peg to US dollar (Managed floating)	
February 1978-June 1978	Pre announced crawling peg to US dollar/Freely falling (Managed floating)	The Tablita Plan
July 1978-June 30, 1979	Pre announced crawling peg to US dollar (Peg)	The Tablita Plan
June 30, 1979-June 15, 1982	Peg to US dollar (Peg)	The second phase of the Tablita Plan
June 15, 1982-December, 1982	Freely falling/Managed floating/Dual Market	
December 1982-December 8, 1984	Managed floating/Dual Market (Managed floating)	Parallel market premium reaches 102% in early 1983. On March 1983 the intention to follow a PPP rule was announced.
December 8, 1984-January 1988	Managed floating/Dual Market (Managed floating)	PPP rule. The official rate is kept within a +/- 2% crawling band to US dollar.
January 1988-January 1, 1989	De facto crawling band around US dollar/Dual Market (Managed floating)	PPP rule. +/- 5% band. Official pre-announced +/- 3% crawling band to US dollar. While the official rate remains within the pre-announced band, parallel market premium remain in double digits.
June 1, 1989-January 22, 1992	Pre announced crawling band around US dollar/Dual Market (Managed floating)	PPP rule. Band width is +/- 5%.
January 22, 1992- January 20, 1997	De facto crawling band around US dollar/Dual Market (Managed floating)	PPP rule. Band is +/- 5%. There is an official pre-announced +/- 10% crawling band to US Dollar. Parallel premium falls below 15 percent and into single digits.
January 20, 1997-June 25, 1998	De facto crawling band to US dollar/Dual Market (Managed Floating)	Official pre-announced crawling +/- 12.5% band to US dollar; de facto band is +/- 5% .
June 25, 1998-September 16, 1998	Pre-announced crawling band to US dollar/Dual Market (Managed Floating)	+/- 2.75% band.
September 16, 1998-December 22, 1998	Pre announced crawling band to US dollar/ Dual Market (Managed Floating)	+/- 3.5% band.
December 22, 1998-September 2, 1999	Pre announced crawling band to US dollar/ Dual Market (Managed Floating)	+/- 8% band.
September 2, 1999-December 2001	Managed floating (Independently floating)	Rates are unified.

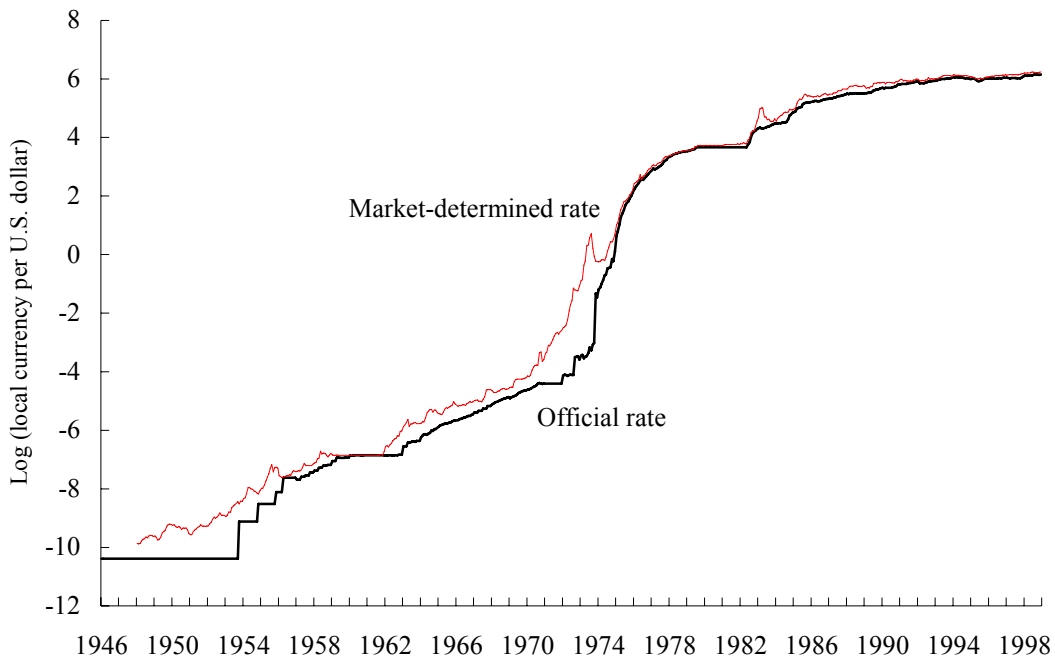
Notes: Reference currency is the US dollar.

Data availability:

Official rate, 1900:1-2001:12

Parallel rate, 1946:1-1998:12

Official and Market-determined Exchange Rates



Monthly Parallel Market Premium

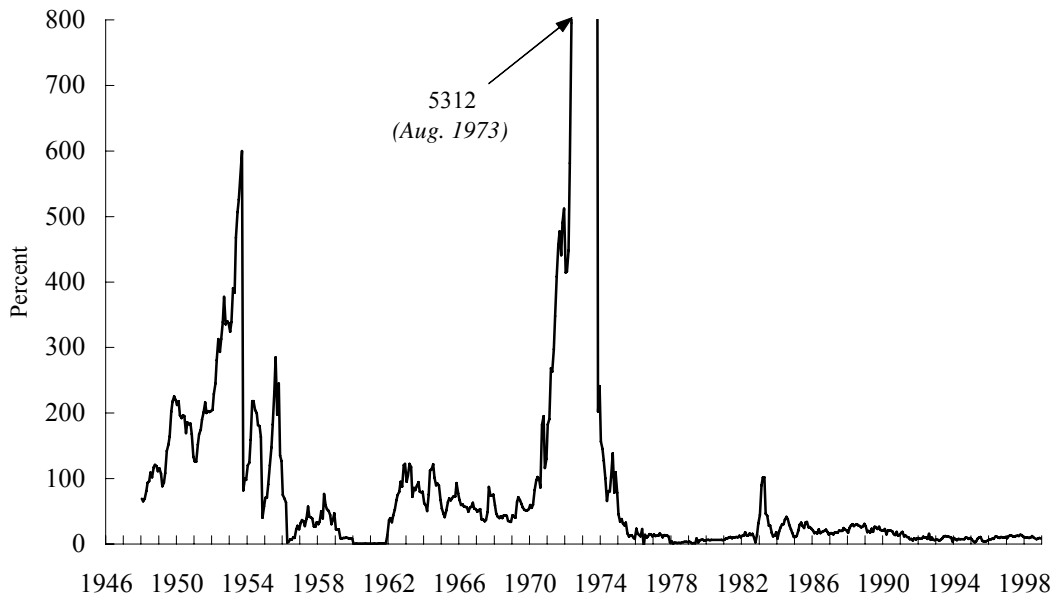


FIGURE V
Official and Market-determined Exchange Rates and the Parallel Market Premium:
January 1946 - December 1998

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

a crawling peg or a crawling band, with the rate of crawl varying through time and notably slowing as inflation began to stabilize following the Tablita plan of the early 1980s. The bottom panel plots the parallel market premium (in percent). This pattern is representative of many other countries in our sample; the premium skyrockets in the periods of economic and political instability, declines into single digits as credible policies are put in place and capital controls are eased. As we will discuss in the next section, the Chilean case is also illustrative, in that crawling pegs or bands are quite common. Figure VI, which shows the path of the exchange rate for the Philippines, India and Greece, provides other examples of the plethora of crawling pegs or bands in our sample.

III.C. Alternative Taxonomies: Comparing the Basic Categories

Altogether, our taxonomy of exchange rate arrangements includes the 14 classifications sketched in Table V (or 15 if hyperfloats are treated as a separate category). Of course, 14 (or 15) buckets are not exhaustive, for example, if one wishes to distinguish between forward- and backward looking crawls or bands, along the lines of Cottarelli and Giannini [1998]. Given that we are covering the entire post World War II period, we did not have enough information to make that kind of finer distinction. Conversely, because we sometimes want to compare our classification regime with the coarser official one, we also show how to collapse our 14 types of arrangements into five broader categories; see Table V, where the least flexible arrangements are assigned the lowest values in our scale.

In the finer grid, we distinguish between pre-announced policies and the less transparent de facto regimes. Since the former involve an explicit announcement while the latter leave it to financial market analysts to determine the implicit exchange rate policy, in the finer classification we treat pre-announcement as less flexible than de facto. We accordingly assign it a lower number in our scale. Those not interested in testing whether announcements serve as a coordinating device (say, to make a speculative attack more likely) and only interested in sorting out the degree of observed exchange rate flexibility will prefer the coarser grid. However, even in the coarse grid, it is imperative to treat freely falling as a separate category.

TABLE V
The Fine and Coarse Grids of the Natural Classification Scheme

Natural classification bucket	Number assigned to category in:	
	Fine grid	Coarse grid
No separate legal tender	1	1
Pre announced peg or currency board arrangement	2	1
Pre announced horizontal band that is narrower than or equal to +/- 2%	3	1
De facto peg	4	1
Pre announced crawling peg	5	2
Pre announced crawling band that is narrower than or equal to +/- 2%	6	2
De facto crawling peg	7	2
De facto crawling band that is narrower than or equal to +/- 2%	8	2
Pre announced crawling band that is wider than +/- 2%	9	2
De facto crawling band that is narrower than or equal to +/- 5%	10	3
Non-crawling band that is narrower than or equal to +/- 2% ^a	11	3
Managed floating	12	3
Freely floating	13	4
Freely falling (includes hyperfloat)	14	5

Source: The authors.

^a By contrast to the common crawling bands, a non-crawling band refers to the relatively few cases that allow for **both a** sustained appreciation and depreciation of the exchange rate over time. While the degree of exchange rate variability in these cases is modest at higher frequencies (i.e., monthly), lower frequency symmetric adjustment is allowed for.

Notes: Appendix 1 provides a detailed discussion of our classification algorithm.

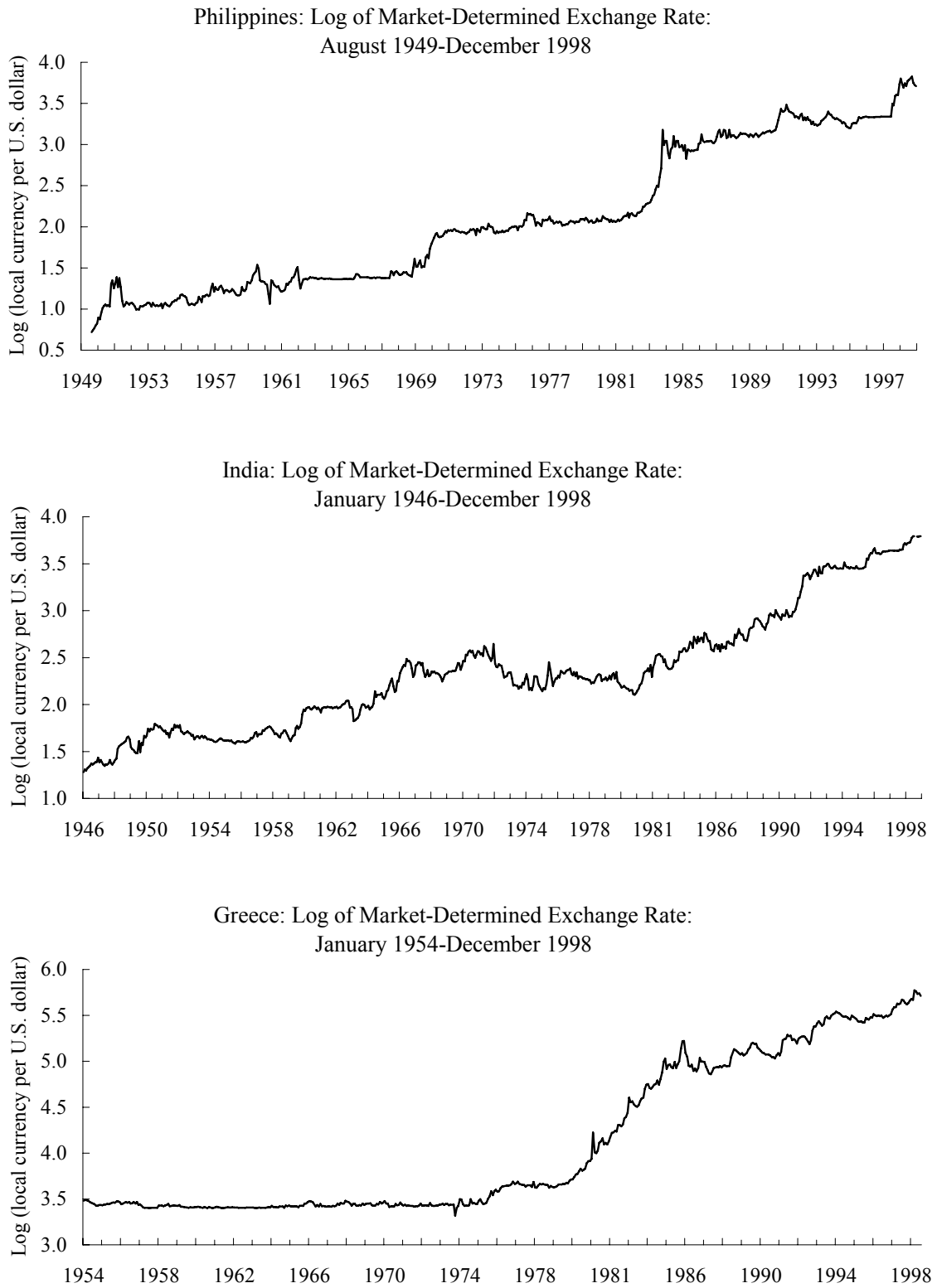


FIGURE VI
The Prevalence of Crawling Pegs and Bands

Pick and Sedillot (1971), *International Currency Analysis*, *World Currency Report*, various issues.

IV. THE “NATURAL” TAXONOMY: CRITIQUES AND COMPARISONS

As the previous section described, our classification strategy relies importantly on the observed behavior of the market-determined exchange rate. In this section, we first address some potential critiques of our approach, including whether a country’s international reserve behavior should affect its classification, and whether we may be mislabeling some regimes as pegs or crawls simply due to the absence of shocks. We then proceed to compare our results to the “official history,” and provide examples of how our reclassification may reshape some of the existing evidence on the links between exchange rate arrangements and various facets of economic activity.

IV.A. The Trilogy: Exchange Rates, Monetary Policy, and Capital Controls

To capture the nuances of any exchange rate arrangement one might also want information on the presence and effectiveness of capital controls, the modalities of (sterilized or unsterilized) foreign exchange intervention, and the extent to which interest rates (or other less conventional types of intervention) are used as a means to stabilize the exchange rate. Since, for the purposes of universality, our classification rests squarely on the univariate time series behavior of the nominal exchange rates (combined with historical chronologies), in this subsection we address some of these limitations to our approach.

Some studies have reclassified exchange rate arrangements by also factoring in the behavior of foreign exchange reserves as reported by the IMF’s *International Financial Statistics*²⁴ However, as Calvo and Reinhart [2002] note, using reserves has serious limitations. In Brazil and in over two dozen other countries foreign exchange market intervention is frequently done through purchases and

²⁴ For instance, the algorithm used by Levy-Yeyati and Sturzenegger [2002] also uses (besides the exchange rate) reserves and base money. This gives rise to many cases of what they refer to as “one classification variable not available.” This means that their algorithm cannot provide a classification for the United Kingdom (where it is hard to imagine such data problems) until 1987 and--in the most extreme of cases--some developing countries cannot be classified for any year over their 1974-2000 sample.

sales of domestic dollar-linked debt.²⁵ This debt is not reflected in the widely used IFS reserve data, neither were the massive interventions of the Thai authorities in the forward market during 1997 and in South Africa thereafter. Furthermore, as financial liberalization has spread through the globe, there has been a widespread switch from direct intervention in the foreign exchange market to the use of interest rate policy in the 1990s as a means to stabilize the exchange rate.²⁶ Picking up on this kind of policy intervention requires having the policy interest rate—the equivalent of the federal funds rate for the United States—for each country. Such data is very difficult to come by and none of the other efforts at reclassification have dealt with issue.

Other issues arise in the context of the links between monetary, capital controls, and exchange rate policy. In particular, while fixing the exchange rate (or having narrow bands, or crawling pegs or bands) largely defines monetary policy, our two most flexible arrangement categories (managed or freely floating) do not. Floating could be consistent with monetary targets, interest rate targets, or inflation targeting, the latter being a relatively recent phenomenon.²⁷ Since our study dates back to 1946, it spans a sea change in capital controls and monetary policy regimes and it is beyond the scope of this paper to subdivide the monetary policy framework for the most flexible arrangements in our grid. Apart from exchange rate policy, however, our study sheds considerable light on the third leg of the trinity—capital controls. While measuring capital mobility has not been the goal of this paper, our data consistently show that the parallel market premium dwindles into

²⁵ See Reinhart, Rogoff, and Savastano [2003] for a recent compilation of data on domestic dollar-linked debt.

²⁶ There are plenty of recent examples where interest rates were jacked up aggressively to fend off a sharp depreciation in the currency. Perhaps one of the more obvious examples is in the wake of the Russian default in August 1998, when many emerging market currencies came under pressure and countries like Mexico responded by doubling interest rates (raising them to 40 percent) within a span of a couple of weeks.

²⁷ Indeed, several of the inflation targeters in our sample (UK, Canada, Sweden, etc) are classified as managed floaters. (However, it must also be acknowledged that there are many different variants of inflation targeting, especially in emerging markets.)

insignificance with capital market integration, providing a promising continuous measure of capital mobility.

IV.B. Exchange Rates and Real Shocks

Ideally, one would like to distinguish between exchange rate stability arising from deliberate policy actions (whether its direct foreign exchange market intervention or interest rate policy, as discussed) and stability owing to the absence of economic or political shocks. In this subsection, we provide evidence that, if the exchange rate is stable and it is accordingly treated in our *de jure* approach to classification, it is typically not due to an absence of shocks.

Terms of trade shocks are a natural source of potential shocks, particularly for many developing countries. Similarly, the presence (or absence) of shocks is likely to be reflected in the volatility of real GDP. To investigate the incidence and size of terms of trade shocks we constructed monthly terms of trade series for 172 countries over the period 1960-2001.²⁸ The terms of trade series is a geometric weighted average of commodity prices (fixed weights based on the exports of 52 commodities).

Table VI presents a summary by region of the individual country findings. The first column shows the share of commodities in total exports, while $\sigma \Delta tot$ denotes the variance of the monthly change in the terms of trade of the particular region relative to Australia. Australia is our benchmark, as it is both a country that is a primary commodity exporter and has a floating exchange rate that, by some estimates, approximates an optimal response to terms of trade shocks (see Chen and Rogoff, [2003]). The next three columns show the variance of the monthly change in the terms of trade of the region relative to Australia ($\sigma \Delta tot$), exchange rate of the individual region relative to Australia ($\sigma \Delta e$) and the variance of the annual change in real GDP of the region relative to

²⁸ Table VI is based on the more extensive results in Reinhart, Rogoff, and Spilimbergo [2003].

Australia ($\sigma \Delta y$). The last two columns show the variance of the exchange rate relative to the variance of the terms of trade ($\frac{\sigma \Delta e}{\sigma \Delta tot}$) and output ($\frac{\sigma \Delta e}{\sigma \Delta y}$), respectively.

A priori, adverse terms of trade shocks should be associated with depreciations and the converse for positive terms of trade shocks; greater volatility in the terms of trade should go hand-in-hand with greater volatility in the exchange rate. (In Chen and Rogoff [2003], there is greater volatility even under optimal policy.) Table VI reveals several empirical regularities: (a) Most countries (regions) have more variable terms of trade than Australia—in some cases, such as the Middle East and the Caribbean, as much as three or four times as variable. (b) Real GDP is also commonly far more volatile than in Australia. (c) Most countries' exchange rates appear to be far more stable than Australia's, as evidenced by relatively lower variances for most of the groups. (d) Following from the previous observations, the last two columns show that for most of the country groupings that the variance of exchange rate changes is lower than that of changes in the terms of trade or real GDP. Taken together, the implication of these findings is that if the exchange rate is not moving, it is not for lack of shocks. Of course, terms of trade are only one class of shocks that can cause movement in the exchange rate. Thus, considering other kinds of shocks--political and economic, domestic and international--would only re-enforce the results presented here.

TABLE VI
 Terms of Trade, Output, and Exchange Rate Variability
 Variance Ratios (normalized to Australia and excludes freely falling episodes)

Region	Share	$\sigma \Delta tot$	$\sigma \Delta e$	$\sigma \Delta y$	$\frac{\sigma \Delta e}{\sigma \Delta tot}$	$\frac{\sigma \Delta e}{\sigma \Delta y}$
North Africa	0.51	3.29	0.93	2.54	0.64	0.23
Rest of Africa (excluding CFA)	0.56	2.92	2.87	2.50	1.29	1.38
Middle East	0.60	4.15	0.95	3.48	0.33	0.50
Development Asia/Pacific	0.34	2.02	0.85	2.40	0.54	0.44
Industrialized Asia	0.18	0.82	0.97	1.15	1.23	0.86
Caribbean	0.50	4.15	0.67	2.40	0.20	0.35
Central America	0.62	3.02	0.49	2.11	0.21	0.28
South America	0.63	2.03	1.08	2.15	0.66	0.52
Central East Europe	0.24	0.60	1.03	1.51	1.66	0.78
Western Europe	0.18	1.75	0.84	1.25	0.76	0.56
North America	0.33	1.64	0.60	1.12	0.47	0.54

Source: Reinhart, Rogoff, and Spilimbergo [2003] and sources cited therein.

Notes: The variable definitions are as follows: Share = share of primary commodities to total exports; the next three columns show the variance of the monthly change in the terms of trade of the region relative to Australia ($\sigma \Delta tot$), the variance of the monthly change in the exchange rate of the individual region relative to Australia ($\sigma \Delta e$), and the variance of the annual change in real GDP of the region relative to Australia ($\sigma \Delta y$); the last two columns show the variance of the exchange rate relative to the variance of the terms of trade ($\frac{\sigma \Delta e}{\sigma \Delta tot}$) and

output ($\frac{\sigma \Delta e}{\sigma \Delta y}$), respectively.

IV.C Fact and Fiction: Natural and Artificial?

We are now prepared to contrast the official view of the history of exchange rate regimes with the view that emerges from employing our alternative methodology. To facilitate comparisons, we will focus mainly on the coarse grid version of the Natural system.

Figure VII, highlights some of the key differences between the Natural and IMF classifications. The dark portion of the bars denote the cases where there is overlap between the IMF and the Natural classification.²⁹ The white bar shows the cases where the IMF labels the regime in one way (say, a peg in 1970-73) and the Natural labels it differently. Finally, the striped portion of the bars indicate the cases where the Natural classification labels the regime in one way (say, freely falling, 1991-2001) and the IMF labels differently (say, freely floating). As shown in Figure VII, according to our Natural classification system, about forty percent of all regimes in 1950 were pegs (since many countries had dual/parallel rates that did not qualify as pegs.) Figure VII also makes plain that some of the “pegs” in our classification were not considered pegs under the official classification; in turn, our algorithm rejects almost half of the official pegs as true pegs. Our reclassification of the early post-war years impacts not only on developing countries, but on industrialized countries as well; nearly all the European countries had active parallel markets after World War II.

A second reason why our scheme shows less pegs is that the IMF’s pre-1997 scheme allowed countries to declare their regimes as “pegged to an undisclosed basket of currencies.” This notably non-transparent practice was especially popular during the 1980s, and it was also under this that a great deal of managed floating, freely floating and freely falling actually took place.

For the period 1974-1990, the official classification has roughly 60 percent of all regimes as pegs; our classification has only half as many. Again, as we see in Figure VII, this comparison

²⁹ Specifically, both classifications assigned the regime for a particular country in a given particular year to the same category.

understates the differences since some of our pegs are not official pegs and vice versa. For the years 1974-1990, and 1991-2001, one can see two major trends. First, “freely falling,” continues to be a significant category, accounting for 12 percent of all regimes from 1974-1990, and 13 percent of all regimes from 1991-2001. For the transition economies in the 1990s, over 40 percent of the observations are in the freely falling category. Of course, what we are reporting in Figure VII is the *incidence* of each regime. Clearly, future research could use GDP weights and--given that, low-income countries are disproportionately represented in the freely falling category—this would reveal a lower importance to this category.³⁰

³⁰ GDP weights and population weights would, of course, present very different pictures. For example, the US and Japan alone would increase the world’s share of floaters if it were GDP weights, while weight by population would increase the weight of fixers by China alone.

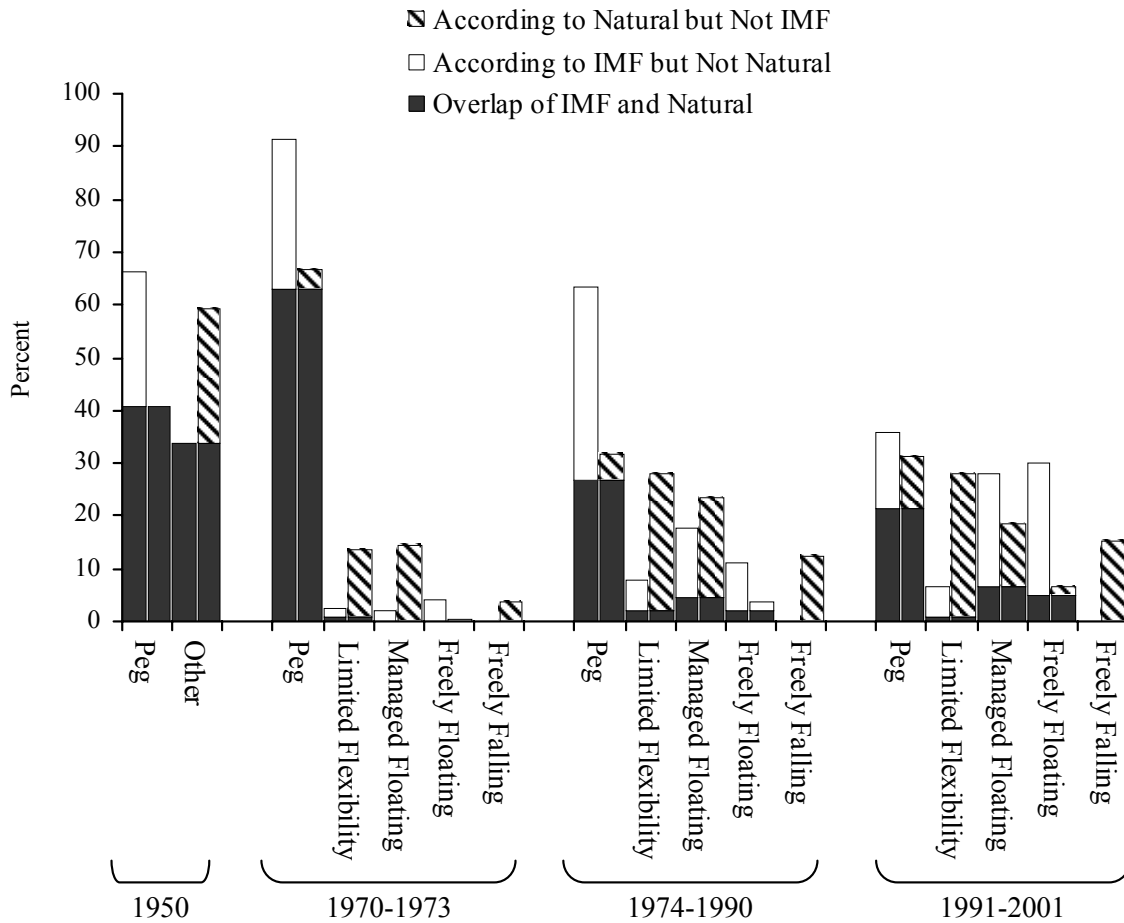


FIGURE VII
Comparison of Exchange Rate Arrangements According to the IMF Official and Natural Classifications, 1950-2001

Notes: The dark bars show the overlap between the IMF and Natural classification (i.e. for that particular year the IMF and Natural classifications coincide); the white bars show the cases where the IMF classification labeled the regime in one way (say, a peg in 1974-1990) and the Natural classification labeled it differently; the striped bars indicate the cases where the Natural classification labeled the regime in one way (say, freely falling) and the IMF labeled it differently (say, freely floating).

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

Second, the Natural classification scheme reveals a bunching to the middle in terms of exchange rate flexibility, when compared to the official monetary history of the world. Limited flexibility—which under the Natural classification is dominated by de facto crawling pegs—becomes notably more important. From being a very small class under the official scheme, the Natural classification algorithm elevates limited flexibility to the second most important grouping over the past decade, just behind pegs. Another startling difference is the reduced importance of freely floating. According to the official classification, more than 30 percent of countries were independently floating during 1991-2001. According to the Natural classification, less than 10 percent were freely floating. This is partly a manifestation of what Calvo and Reinhart [2002] term “fear of floating,” but equally because we assign high inflation floats (including ones that are officially “pegs”) to our new freely falling category. Indeed, more countries had freely falling exchange rates than had freely floating exchange rates!

The contrast between the IMF and Natural classification systems becomes even more striking when one sees just how small the overlap is between the two classifications country by country and year by year. As shown in Table VII, if the IMF designation of the regime is a peg (1970-2001), there is a 44 percent probability that our algorithm will place it into a more flexible arrangement. If the official regime is a float, there is a 31 percent chance we will categorize it as a peg or limited flexibility. If the official regime is a managed float, there is a 53 percent chance our algorithm will categorize it as a peg or limited flexibility. Whether the official regime is a float or peg, it is virtually a coin toss whether the Natural algorithm will yield the same result. The bottom of the table gives the pairwise correlation between the two classifications, with the official classification running from 1 (peg) to 4 (independently floating), and the Natural classification running from 1 (peg) to 5 (freely falling). The simple correlation coefficient is only 0.42. As one can confirm from the chronologies, the greatest overlap occurs in the classification of the G3 currencies and of the limited flexibility European arrangements. Elsewhere, and especially in developing countries, the two classifications differ significantly, as we shall see.

TABLE VII
Floating Pegs and Pegged Floats: Revisiting the Past, 1970-2001

Conditional probability that the regime is:	In percent
“Other” according to NC ^a conditional on being classified “Peg” by IMF	44.5
“Peg” or “Limited Flexibility” according to NC conditional on being classified “Managed Floating” by IMF	53.2
“Peg” or “Limited Flexibility” according to NC conditional on being classified “Independently Floating” by IMF	31.5
Pairwise correlation between IMF and NC classifications	42.0

Sources: The authors’ calculations.

^a NC refers to the Natural Classification; “Other” according to NC includes limited flexibility, managed floating, freely floating, and freely falling.

IV.D. The Pegs that Float

Figure VIII plots the parallel market premium since January 1946, in percent, for Africa, Asia, Europe and Western Hemisphere. As is evident from the Figure VIII, for all the regions except Europe, it would be difficult to make the case that the breakdown of Bretton Woods was a singular event, let alone a sea change.³¹ For the developing world, the levels of pre- and post-1973 volatilities in the market-determined exchange rate, as revealed by the parallel market premium, are remarkably similar. Note that for all regions, we exclude the freely falling episodes that would significantly increase the volatility but also distort the scale. To give a flavor of the cross-country variation within region and across time, the dashed line plots the regional average plus one standard deviation (calculated across countries and shown as a 5-year moving average).

³¹ We plot the premium rather than the market-determined rate, as it allows us to aggregate across countries in comparable units (percent).

As regards Europe, the story told by Figure VIII is consistent with the characterization of the Bretton Woods system as a period of when true exchange rate stability was remarkably short-lived. From 1946 until the arrival of the late 1950s, while Europe was not floating in the modern sense--as most currencies were not convertible--it had some variant of de facto floating under the guise of pegged official exchange rates. Each time official rates are realigned, the story had already unfolded in the parallel market (as shown earlier in Figure II). While the volatility of the gap between the official rate and the market exchange rate is not quite in the order of magnitude observed in the developing world, the volatility of the parallel rate is quite similar to the volatility of today's managed or freely floating exchange rates.³²

³² See Bordo [1993] on Bretton Woods and Bordo [2003] on a historical perspective on the evolution of exchange rate arrangements.

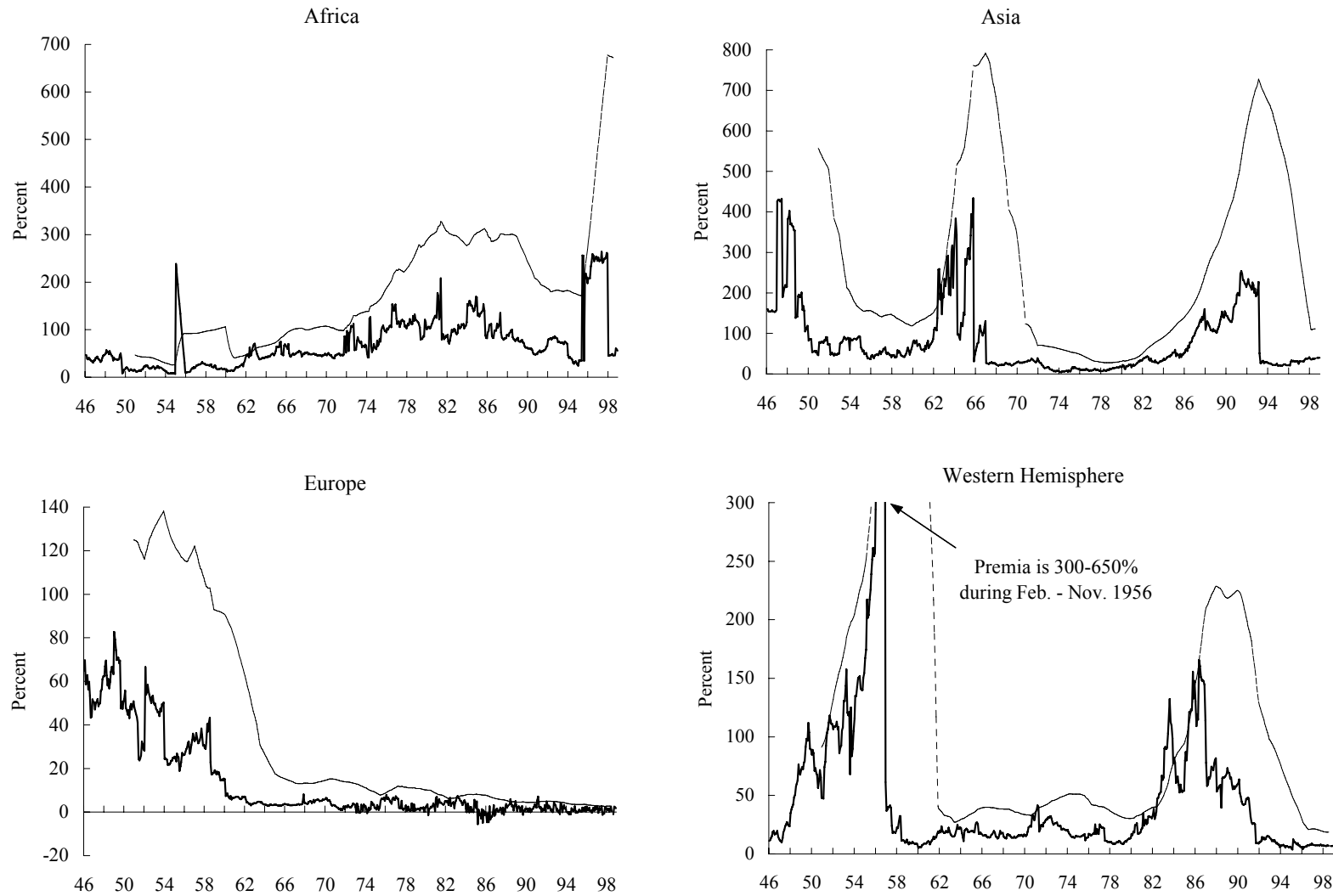


FIGURE VIII
Average Monthly Parallel Market Premium: 1946-1998

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

Note: The solid line represents the average monthly parallel market premium while the dashed line shows the five-year moving average of plus one standard deviation. The regional averages are calculated excluding the freely falling episodes.

There are many interesting country examples that illustrate visually just how little changed before and after the breakup of Bretton Woods.³³ Clearly, more careful statistical testing is required to make categorical statements about when a structural break took place; but it is obvious from the figures that whatever break might have taken place hardly lives up to the usual image of the move from fixed to flexible rates.

IV.E. The Floats that Peg

Figure IX provides a general flavor of how exchange rate flexibility has evolved over time and across regions. The figure plots five-year moving averages of the probability that the monthly percent change in the exchange rate remains within a two percent band for Africa, Asia, Europe and Western Hemisphere (excluding only the United States). Hence, under a pegged arrangement, assuming no adjustments to the parity, these probabilities should equal 100 percent. As before, we exclude the freely falling episodes. For comparison purposes, the figures plot the unweighted regional averages against the unweighted averages for the “committed floaters”. (The committed floaters include the following exchange rates against the dollar: Yen, DM (euro), Australian dollar, and the UK pound). The dashed lines, which show plus/minus one standard deviation around the regional averages, highlight the differences between the group of floaters and the regional averages.

It is evident for all regions (this applies the least to Africa) that the monthly percent variation in the exchange rate has typically been kept to a minimum—there is a great deal of smoothing of exchange rate fluctuations in all regions when compared to the usual monthly variations of the committed floaters. The smoothing is most evident in Asia where the index hovers around 90 percent for most of the period, versus 60-70 percent for the floaters. Hence, over time, the nature of the

³³ The country-by-country figures in “The Country Chronologies and Chartbook, Background Material to A Modern History of Exchange Rate Arrangements: A Reinterpretation” at <http://terpconnect.umd.edu/~creinhar/Papers.html> are particularly revealing in this regard.

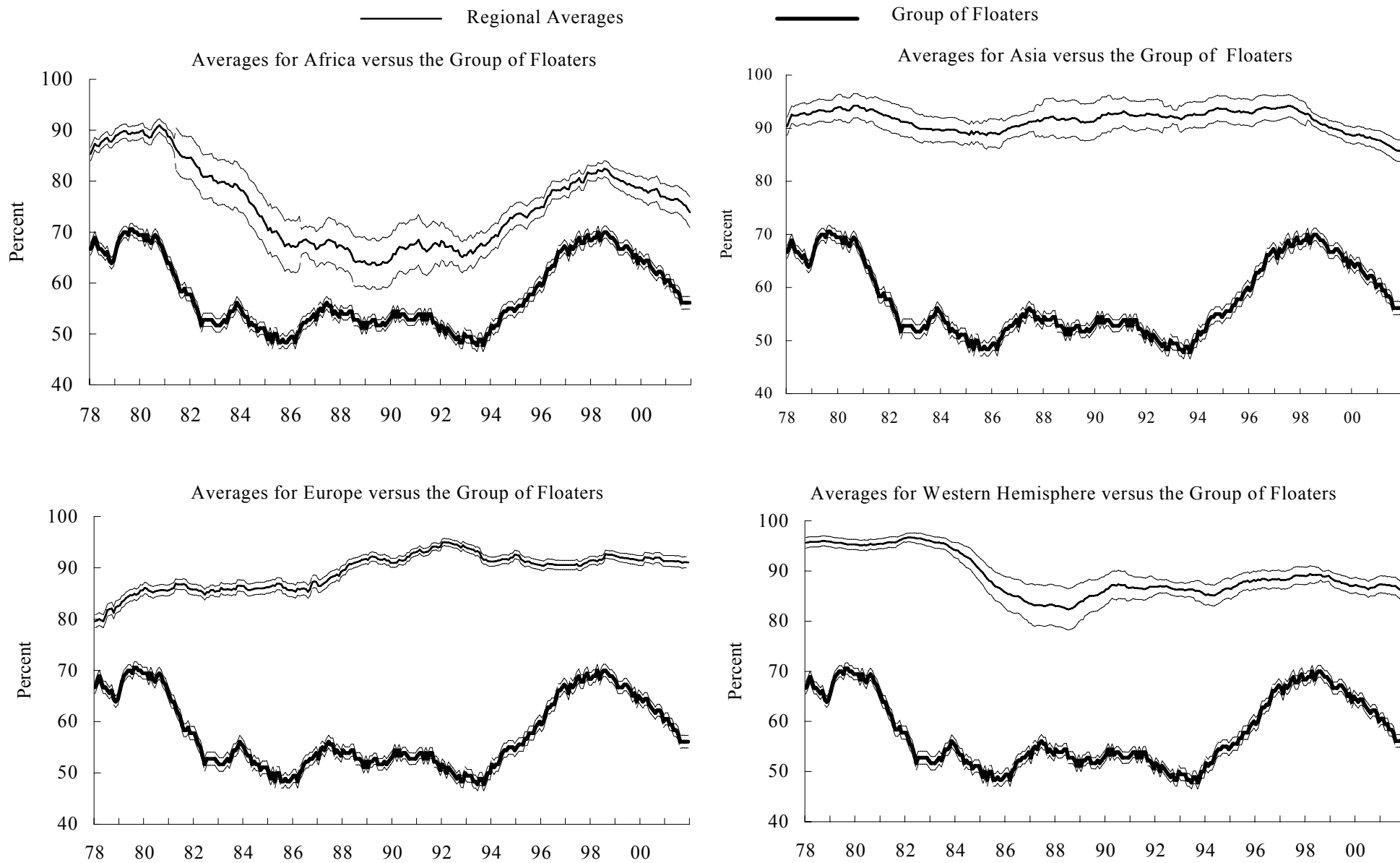


FIGURE IX
 Absolute Monthly Percent Change in the Exchange Rate: Percent of Observations within a +/- 2 Percent Band
 (5-year moving average)

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

Note: The solid line represents the average for the group while the dashed lines show plus/minus one standard deviation. The regional averages are calculated excluding the freely falling episodes.

classification problem has evolved from labeling something as a peg when it is not, to labeling something as floating when the degree of exchange rate flexibility has in fact been very limited.

IV.F. Does the Exchange Rate Regime Matter?

The question of whether the exchange rate arrangement matters for various facets of economic activity has, indeed, been a far-reaching issue over the years in the literature on international trade and finance, and is beyond the scope of this paper. In this subsection we present a few simple exercises, that do not speak to possible causal patterns between exchange rate regimes and economic performance, but are meant as illustrative of the potential usefulness of our classification. First, consider Table VIII, which separates dual/parallel markets from all the other regimes where the “exchange rate is unitary,” to employ the language of the IMF. The top row shows average inflation rates and real per capita GDP growth for the period 1970-2001 for dual arrangements separately from all other regimes. This two-way split drastically alters the picture presented by the IMF’s classification in the top and fourth rows of Table IX, which does not treat dual markets as a separate category. Dual (or multiple) exchange rate episodes are associated with an average inflation rate of 163 percent versus 20 percent for unified exchange markets—growth is one percentage point lower for dual arrangements. The explanation for this gap between the outcomes shown in Table VIII and the IMF’s in Table IX is twofold. First, 62 percent of the freely falling cases during 1970-2001 were associated with parallel markets or dual or multiple exchange rates. Second, the high inflation cases classified by the IMF as freely floating were moved to the freely falling category Natural classification. Again, we caution against overinterpreting the results in Table VIII as evidence of causality, as exchange controls and dual markets are often introduced amidst political and economic crises—as the recent controls in Argentina (2001) and Venezuela (2003) attest.

TABLE VIII
Inflation and Per Capita Real GDP Growth:
A Comparison of Dual (or Multiple) and Unified Exchange Rate Systems
1970-2001

Regime	Average annual inflation rate	Average per capita real GDP growth
Unified exchange rate	19.8	1.8
Dual (or multiple) exchange rates	162.5	0.8

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions* and *International Financial Statistics*, Pick and Sédillot [1971], International Currency Analysis, *World Currency Report*, various issues.

Notes: The averages for the two regime types (unified and dual) are calculated on a country-by-country and year-by-year basis. Thus, if a country has a unified exchange rate for most of the year, the observation for that year is included in the averages for unified rates; if in the following year that same country introduces a dual market (or a multiple rates) for most of the year, the observation for that year is included in the average for dual rates. This treatment allows us to deal with transitions across regime types over time.

As Table IX highlights, according to the IMF, only limited flexibility cases record moderate inflation. On the other hand, freely floating cases record the best inflation performance (9 percent) in the Natural classification. Freely falling regimes exhibit an average annual inflation rate 443 percent versus an inflation average in the 9 to 17 percent range for the other categories (Table IX).

TABLE IX
Do Classifications Matter?
Growth, Inflation, and Trade Across Regimes: 1970 to 2001

Classification scheme	Peg	Limited Flexibility	Managed Floating	Freely Floating	Freely Falling
Average annual inflation rate					
IMF Official	38.8	5.3	74.8	173.9	n.a.
Natural	15.9	10.1	16.5	9.4	443.3
Average annual per capita real GDP growth					
IMF Official	1.4	2.2	1.9	0.5	n.a.
Natural	1.9	2.4	1.6	2.3	-2.5
Exports plus imports as a percent of GDP					
IMF Official	69.9	81.0	65.8	60.6	n.a.
Natural	78.7	80.3	61.2	44.9	57.1

Source: International Monetary Fund, *World Economic Outlook*.

Notes: An n.a. denotes not available. The averages for each regime type (peg, limited flexibility, etc.) are calculated on a country-by-country and year-by-year basis. Thus, if a country has a pegged exchange rate for most of the year, the observation for that year is included in the averages for pegs; if in the following year that same country has a managed float for most of the year, the observation for that year is included in the average for managed floats. This treatment allows us to deal with transitions across regime types over time.

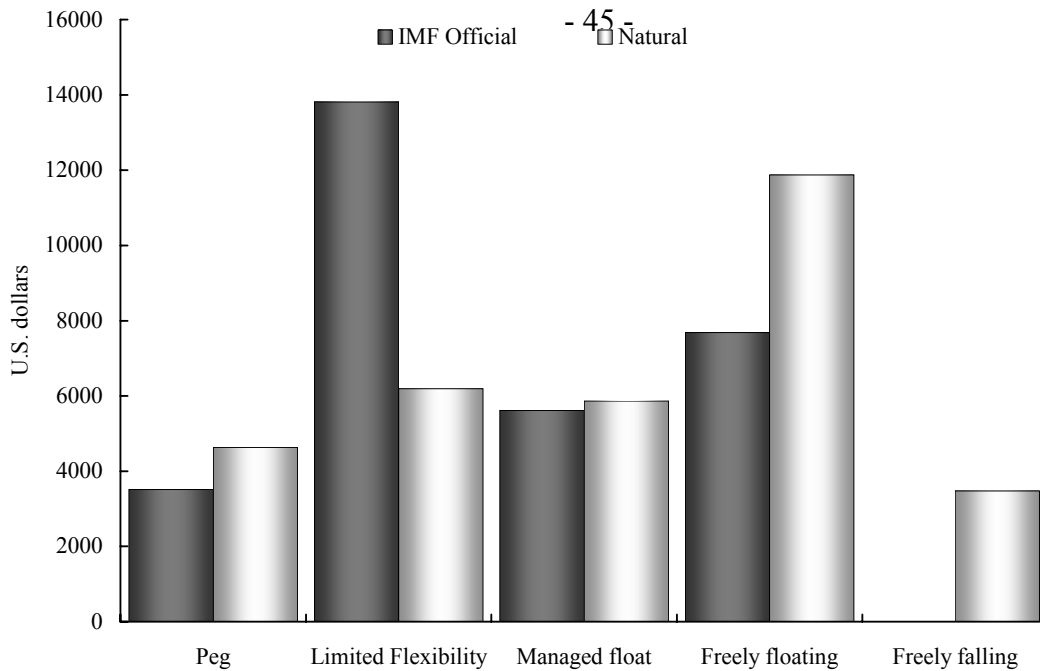


FIGURE X
 PPP Adjusted GDP Per Capita Across Regime Types: 1970-2001
(averaging over all regions)

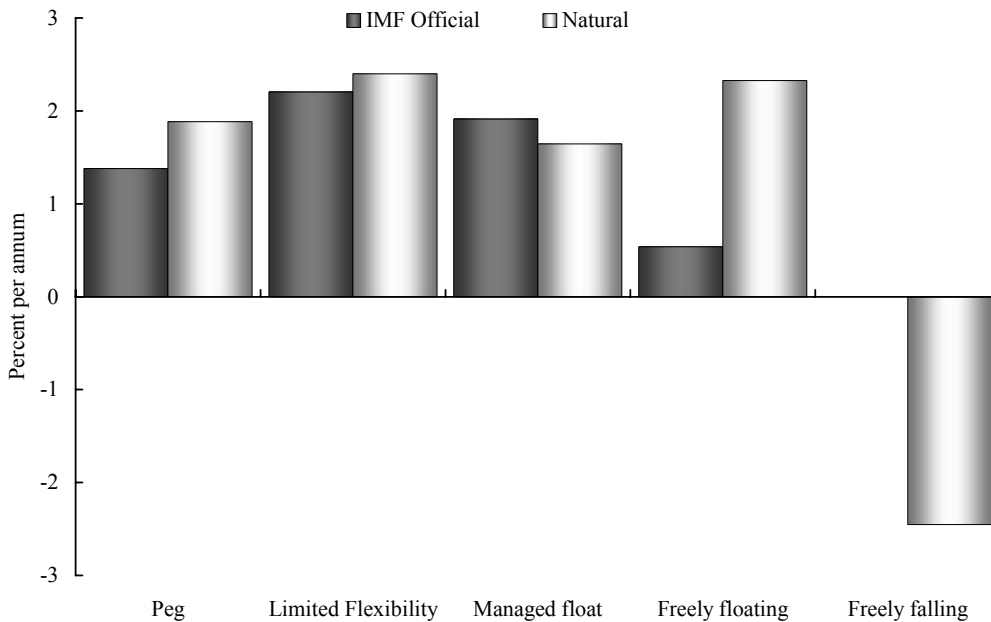


FIGURE XI
 Real Per Capita GDP Growth Across Regime Types: 1970 - 2001
(averaging over all regions)

Sources: International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions and International Financial Statistics*, Pick and Sedillot (1971), International Currency Analysis, *World Currency Report*, various issues.

Notes: The averages for each regime type (peg, limited flexibility, etc.) are calculated on a country-by-country and year-by-year basis. Thus, if a country has a pegged exchange rate for most of the year, the observation for that year is included in the averages for pegs; if in the following year that same country has a managed float for most of the year, the observation for that year is included in the average for managed floats. This treatment allows us to deal with transitions across regime types over time.

The contrast is also significant both in terms of the level of per capita GDP (Figure X) and per capita growth (Figure XI and Table IX). Freely falling has the lowest per capita income (US \$3,476) of any category—highlighting that the earlier parallel to the HIPC debtor is an apt one—while freely floating has the highest (US \$13,602). In the official IMF classification, limited flexibility, which was almost entirely comprised of European countries, shows the largest per capita income.

Growth is negative for the freely falling cases (-2.5 percent) versus growth rates in the 1.6-2.4 percent range for the other categories. Once freely falling is a separate category, the differences between our other classifications pale relative to the differences between freely falling and all others (Table VIII). In the official IMF classification, freely floating shows a meager average growth rate of 0.5 percent for the independently floating cases. For the Natural classification, the average growth rate quadruples for the floaters to 2.3 percent. Clearly, this exercise highlights the importance of treating the freely falling episodes separately.

V. CONCLUDING REMARKS

According to our Natural classification, across all countries for 1970-2001, 45 percent of the observations officially labeled as a “peg” should, in fact, have been classified as limited flexibility, managed or freely floating—or worse, “freely falling.” Post Bretton Woods, a new type of misclassification problem emerged and the odds of being officially labeled a “managed float” when there was a de facto peg or crawling peg was about 53 percent. We thus find that the official and other histories of exchange rate arrangements can be profoundly misleading, as a striking number of pegs are much better described as floats, and vice-versa.

These misclassification problems may cloud our view of history along some basic dimensions. Using the IMF’s classification for the period 1970 to 2001, for instance, one would conclude that a freely floating exchange rate is not a very attractive option—it produces an average annual inflation rate of 174 percent and a paltry average per capita growth rate of 0.5 percent. This is the worst performance of any arrangement. Our classification presents a very different picture: free

floats deliver an average inflation that is less than 10 percent (the lowest of any exchange rate arrangement), and an average per capita growth rate of 2.3 percent. Equally importantly, we find that unified exchange rate regimes vastly outperform dual or multiple exchange rate arrangements, although one cannot necessarily interpret these differences as causal. While we have focused in this paper on the exchange rate arrangement classification issue, the country histories and data provided in this paper may well have consequences for theory and empirics going forward, especially the issue of accounting for dual and parallel markets..

In her classic history of the IMF Margaret G. de Vries looked back at the early years of the Bretton Woods regime and noted:

“Multiple exchange rates were one of the first problems that faced the Fund in 1946, and have probably been its most common problem in the field of exchange rates. An impressive number and diversity of countries in the last twenty years have experimented with one form or another of what the Fund has called multiple currency practices, at least for a few if not most of their transactions...The problem of multiple rates, then, never seems entirely at an end”

Thirty-four years have passed since this history was written and multiple exchange rate practices are showing no signs of becoming *passé*. On December 2001, Argentina suspended convertibility and in so doing, segmented the market for foreign exchange, while on February 7, 2003 Venezuela introduced strict new exchange controls—de facto creating a multiple exchange rate system. Some things never change.

APPENDIX 1. THE DETAILS OF THE “NATURAL” CLASSIFICATION

This appendix describes the details of our classification algorithm, which is outlined in Section III of the paper. We concentrate on the description of the fine grid as shown in Table V.

A. Exchange Rate Flexibility Indices and Probability Analysis

Our judgment about the appropriate exchange rate classification is shaped importantly by the time-series of several measures of exchange rate variability, based on monthly observations and averaged over twenty-four month and five-year rolling windows. The first of these measures is the absolute percent change in the monthly nominal exchange rate. We prefer the mean absolute change to the variance to minimize the impact of outliers. These outliers arise when, for example, there are long periods in which the exchange rate is fixed but, nonetheless, subject to rare but large devaluations.

To assess whether exchange rate changes are kept within a band, we calculate the probabilities that the exchange rate remains within a plus/minus one, two, and five percent-wide band over any given period. Two percent seems a reasonable cutoff to distinguish between the limited flexibility cases and more flexible arrangements, as even in the Exchange Rate Mechanism arrangement in Europe $\pm 2\frac{1}{4}$ bands were allowed. As with the mean absolute deviation, these probabilities are calculated over two-year and five-year rolling windows. Unless otherwise noted in the chronologies, we use the five-year rolling windows as our *primary* measure for the reasons discussed in Section III of the paper. These rolling probabilities are especially useful to detect implicit unannounced pegs and bands.

B. De Jure and de Facto Pegs and Bands

Where the chronologies show the authorities explicitly announcing a peg, we shortcut the de facto dating scheme described below and zero in on the date announced as the start of the peg. We then confirm (or not) the peg by examining the mean absolute monthly change over the period *following* the announcement. The chronologies we develop, which give the day, month and year when a peg becomes operative, are essential to our algorithm. There are two circumstances where we need

to go beyond simply verifying the announced peg. The first case is where our chronologies indicate that the peg applies only to an official rate and that there is an active parallel (official or illegal) market. As shown in Figure III, in these cases we apply the same battery of tests to the parallel market exchange rate as we do to the official rate in a unified market. Secondly, there are the cases where the official policy is a peg to an *undisclosed* basket of currencies. In these cases, we verify if the “basket” peg is really a de facto peg to a single dominant currency (or to the SDR). If no dominant currency can be identified, we do not label the episode as a peg. Potentially, of course, we may be missing some de facto basket pegs, though in practice, this is almost certainly not a major issue.

We now describe our approach towards detecting de facto pegs. If there is no officially-announced peg, we test for a “de facto” peg in two ways: First, we examine the monthly absolute percent changes. If the absolute monthly percent change in the exchange rate is equal to zero for four consecutive months or more, that episode is classified (for however long it lasts) as a de facto peg if there are no dual or multiple exchange rates. This allows us to identify short-lived de facto pegs as well as those with a longer duration. For instance, this filter allowed us to identify the Philippines’ de facto peg to the US dollar during 1995-1997 in the run-up to the Asian crisis as well as the numerous European de facto pegs to the DM well ahead of the introduction of the euro. Second, we compute the probability that the monthly exchange rate change remains within a **one** percent band over a rolling five-year period,

$$P(\varepsilon < 1\%),^{34}$$

where ε is the monthly absolute percentage change in the exchange rate. If this probability is **80** percent or higher, then the regime is classified as a de facto peg or crawling peg over the entire 5-year period. If the exchange rate has no drift, it is classified as a fixed parity; if a positive drift is present, it is labeled a crawling peg; and, if the exchange rate also goes through periods of both appreciation and

³⁴ There are a handful of cases where a two-year window is used. In such instances, it is noted in the chronologies.

depreciation it is dubbed a “non-crawling” peg. Our choice of an 80 percent threshold is not accidental, but rather we chose this value because it appears to do a very good job at detecting regimes one would want to label as pegs, without drawing in a significant number of “false positives.”

Our approach regarding pre-announced and de facto bands follows exactly the same process as that of detecting pre-announced and de facto pegs, we simply replace the +/-1% band with a +/-2% band in the algorithm. If a band is announced and the chronologies show a unified exchange market, we label the episode as a band unless it had already been identified as a de facto peg by the criteria described earlier. But, importantly, we also verify whether the announced and de facto bands coincide, especially as there are numerous cases where the announced (de jure) band is much wider than the de facto band.³⁵ To detect such cases, we calculate the probability that the monthly exchange rate change remains within a +/-2 % band over a rolling 5-year period, $P(\varepsilon < 2\%)$.

If this probability is **80** percent or higher, then the regime is classified as a de facto narrow horizontal, crawling, or non-crawling band (which allows for both a sustained appreciation and depreciation) over the period through which it remains continuously above the 80 percent threshold.

In the case where the pre-announced bands are wide (meaning equal or greater than +/-5%), we also verify +/-5% bands. The specifics for each case are discussed in the country chronologies. For instance, as shown earlier in Table IV, in the case of Chile we found that the de facto band during 1992-1998 was narrower (+/-5%) than that which was announced at the time (+/-10% and +/-12.5%). In the case of Libya, which had an announced a 77 percent wide band along a *fixed central parity* pegged to the SDR over the March 1986-December 2001, we detected a +/-5% *crawling* band to the US dollar.

³⁵ Mexico’s exchange rate policy prior to the December 1994 crisis is one of numerous examples of this pattern. Despite the fact that the band was widening over time, as the floor of the band was fixed and the ceiling was crawling, the peso remained virtually pegged to the US dollar for extended periods of time.

C. Freely Falling

As we emphasize in the text, there are situations, almost invariably due to high or hyper inflation, in which there are mega-depreciations in the exchange rate on a routine and sustained basis. We have argued that it is inappropriate and misleading to lump these cases – which is what all previous classifications (IMF or otherwise) do--with floating rate regimes. We label episodes *freely falling* on the basis of two criteria: First, periods where the 12-month rate of inflation equals or exceeds 40 percent are classified as freely falling unless they have been identified as some form of pre-announced peg or pre-announced narrow band by the above criteria.³⁶ The 40 percent inflation threshold is not entirely arbitrary, as it has been identified as an important benchmark in the literature on the determinants of growth (see Easterly [2001]). As a special sub-category of freely falling, we dub as hyperfloats those episodes that meet Cagan’s [1956] classic definition of hyperinflation (50 percent or more inflation per month).

A second situation where we classify an exchange rate regime as freely falling are the six months immediately following a currency crisis—but only for those cases where the crisis marks a transition from a fixed or quasi fixed regime to a managed or independently floating regime.³⁷ Such episodes are typically characterized by exchange rate overshooting. This is another situation where a large change in the exchange rate does not owe to a deliberate policy; it is the reflection of a loss of credibility and recurring speculative attacks. To date these crisis episodes, we follow a variant of the approach suggested by Frankel and Rose [1996]. Namely, any month where the depreciation exceeds or equals 12 and one-half percent and also exceeds the preceding month’s depreciation by at least 10

³⁶ It is critical that the peg criteria supersede the high inflation criteria in the classification strategy, since historically a majority of inflation stabilization efforts have used the exchange rate as the nominal anchor and in many of these episodes inflation rates at the outset of the peg were well above our 40 percent threshold.

³⁷ This rules out cases where there was a devaluation and a re-peg and cases where the large exchange rate swing occurred in the context of an already floating rate.

percent is identified as a crisis.³⁸ To make sure that this approach yields plausible crisis dates, we supplement the analysis with our extensive country chronologies, which also shed light on balance of payments difficulties.³⁹ Since, as a rule, freely falling is not typically an explicit arrangement of choice, our chronologies also provide for all the freely falling cases, the underlying de jure or de facto arrangement (for example, dual markets, independently floating, etc.).

D. Managed and Freely Floating

Our approach toward identifying managed and freely floating episodes is basically to create these classes out of the residual pool of episodes that, after comprehensive application of our algorithm, have not been identified as an explicit or implicit peg or some form of band, and that are not included in the freely falling category. To proxy the degree of exchange rate flexibility under freely floating and managed floats, we construct a composite statistic, $\varepsilon / P(\varepsilon < 1\%)$.

where the numerator is the mean absolute monthly percent change in the exchange rate over a rolling five-year period, while the denominator flags the likelihood of small changes. For de jure or de facto pegs, this index will be very low (close to or equal to zero), while for the freely falling cases it will be very large. As noted, we only focus on this index for those countries and periods which are candidates for freely or managed floating. We tabulate the frequency distribution of our index for the currencies that are most transparently floating, these include: US dollar/DM-euro, US dollar/yen, US dollar/UK pound, US dollar/Australian dollar, and US dollar/New Zealand dollar beginning on the date in which the float was announced. We pool the observations (the ratio for rolling 5-year averages) for all the floaters. So, for example, since Brazil floated the real in January 1999, we would

³⁸ Frankel and Rose [1996] do not date the specific month of the crisis but the year; their criteria calls for a twenty-five (or higher) depreciation over the year.

³⁹ For instance, the Thai crisis of July 1997 does not meet the modified Frankel-Rose criteria. While the depreciation in July exceeded that of the preceding month by more than 10 percent, the depreciation of the Thai Baht in that month did not exceed 25 percent. For these cases, we rely on the chronologies of events.

calculate the ratio only from that date forward. If the Brazil's ratio falls inside the 99 percent confidence interval (the null hypothesis is freely floating and hence the rejection region is located at the lower tail of the distribution of the floater's group) the episode is characterized as freely floating. If that ratio falls in the lower one percent tail, the null hypothesis of freely floating is rejected in favor of the alternative hypothesis of managed float. It is important to note that managed by this definition **does not** necessarily imply active or frequent foreign exchange market intervention—it refers to the fact that for whatever reason our composite exchange rate variability index, $\varepsilon / P(\varepsilon < 1\%)$, does not behave like the indices for the freely floaters.

E. Dual or Multiple Exchange Rate Regimes and Parallel Markets

Dual rates are essentially a hybrid arrangement. There are cases or periods in which the premium is nil and stable so that the official rate is representative of the underlying monetary policy. The official exchange rate could be pegged, crawling or maintained within some bands, or in a few cases allowed to float. But there are countless episodes where the divergence between the official and parallel rate is so large, that the picture is incomplete without knowledge of what the parallel market rate is doing. The country chronologies are critical in identifying these episodes. In the cases where dual or multiple rates are present or parallel markets are active, we focus on the market-determined rates instead of the official exchange rates. As shown in Figure III, we subject the market-determined exchange rate (dual, multiple or parallel) to the battery of tests described above.⁴⁰ This particular category will especially re-shape how we view the 1940s through the 1960s, where about half the cases in the sample involved dual markets.

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⁴⁰ There are a few such cases in the sample, where only government transactions take place at the official rate.

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