Exchange Rate Regimes: Classification and Consequences

Atish Ghosh¹
PDR
IMF
Aghosh@imf.org

Anne-Marie Gulde
MAE
IMF
Aguldewolf@imf.org

Holger Wolf
BMW Center for German and European Studies
Georgetown University
Wolfhc@georgetown.edu

¹ The paper is based on our forthcoming book, Exchange Rate Regime, Choices and Consequences, MIT Press. The views expressed do not reflect the official views of the IMF.
Introduction

Does the choice of exchange rate regime matter? Few questions in international economics have sparked as much debate yielding as little consensus. Over the thirty years since the breakdown of Bretton Woods countries have adopted a wide variety of regimes, ranging from “dollarization” and currency boards to simple pegs and basket pegs, crawling pegs and target zones to clean floats and dirty floats. This very proliferation of exchange rate regimes suggests that they must matter for something— but quite what, remains an open question. In this paper, we try to answer that question.

Our approach is unabashedly empirical. Theory certainly offers many insights—too many, in fact. There is such an abundance of possible linkages between the exchange rate regime and macroeconomic performance—some offsetting, others reinforcing—that, at a theoretical level, it is difficult to establish any unambiguous relationships at all. Accordingly, in this book, we draw on the experience of some 150-member countries of the International Monetary Fund (IMF) over the past thirty years to address some simple questions. We begin with the (deceptively) simple question of what exactly is meant by a “fixed” (or “pegged,” we use the terms interchangeably) versus a “floating” exchange rate regime, and how might one go about classifying countries as belonging to one category or the other. We then present evidence on the link between exchange rate regimes, inflation and output.

Classification

How should a country’s exchange rate regime be classified? The textbook answer is simple: either the exchange rate is “fixed” or it “floats.” The richness of real world regimes belies this elegant dichotomy as most governments try to reach some (often uneasy) compromise between the different elements of the impossible trinity— independent monetary policy, rigidly fixed exchange rates and complete capital mobility (Frankel (1999)).

Popular regimes run the gamut from currency boards and traditional pegs to crawling pegs, target zones and floats with varying degrees of intervention (Table 1.1, see also Edwards and Savastano (1999)). Before we can undertake any empirical work, therefore, we must first decide upon the appropriate level of aggregation, and on a methodology for classifying regimes. In this chapter, we take up both these issues.
Table 1.1: Major Characteristics of Different Exchange Rate Regimes

<table>
<thead>
<tr>
<th>Regime</th>
<th>Main Characteristics and Principal Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollarization</td>
<td><strong>Key feature:</strong> A foreign currency acts as legal tender. Monetary policy is delegated to the anchor country. <strong>Potential benefits:</strong> Dollarization reduces the time-inconsistency problem (subject to the perceived probability of a re-introduction of domestic money) and real exchange rate volatility. <strong>Potential drawbacks:</strong> Under dollarization external shocks cannot be buffered by exchange rate movements, imposing costs if business cycles are asynchronous; while seignorage revenues decline. <strong>Issues:</strong> The lender-of-last-resort function must be shifted to the fiscal authority.</td>
</tr>
<tr>
<td>Currency Boards</td>
<td><strong>Key feature:</strong> A fixed exchange rate regime (mostly enshrined in law) is complemented by a minimum backing requirement for domestic money in foreign currency. <strong>Potential benefits:</strong> The time-inconsistency problem is reduced (subject to the perceived probability that the regime is abandoned) and real exchange rate volatility is diminished. <strong>Potential drawbacks:</strong> External shocks cannot be buffered by exchange rate movements, imposing costs if business cycles are asynchronous. The scope for lender of last resort activity is restricted to excess reserve holdings and fiscal mechanisms. Requires high reserve holdings. <strong>Issues:</strong> Lender of last resort limits, exit strategy if used as a transitory regime.</td>
</tr>
<tr>
<td>Monetary Union</td>
<td><strong>Key feature:</strong> A group of countries using a common currency issued by a common regional central bank. <strong>Potential benefit:</strong> A monetary union reduces the time inconsistency problem by requiring multinational agreement on policy, and reduces real exchange rate volatility. <strong>Potential drawbacks:</strong> Member countries suffering asymmetric shocks lose a stabilization tool. The cost depends on the extent of asymmetric costs and the availability and effectiveness of alternative adjustment tools. <strong>Issues:</strong> Unknown responsiveness of wage/price setting behavior and migration/investment pattern to the altered regime. Potential sensitivity of voting equilibria to distribution of shocks.</td>
</tr>
<tr>
<td>Traditional Peg</td>
<td><strong>Key feature:</strong> Fixed rate against a single currency or a currency basket. <strong>Potential benefits:</strong> The time inconsistency problem is reduced through commitment to a verifiable target. Devaluation option provides potentially valuable policy tool in response to large shocks. Reduces real exchange rate volatility. <strong>Potential drawbacks:</strong> Provides a target for speculative attacks. Avoids real exchange rate volatility but not necessarily persistent misalignments. Does not by itself place hard constraints on monetary and fiscal policy, and thus provides only a partial solution against time inconsistency problem; the credibility effect depends on accompanying institutional measures and record of accomplishment. <strong>Issues:</strong> Doubts about sustainability in the presence of full capital mobility.</td>
</tr>
<tr>
<td>Crawling Peg</td>
<td><strong>Key feature:</strong> A rule-based system for altering the par value, typically at a predetermined rate or as a function of inflation differentials. <strong>Potential benefits:</strong> An attempt to combine flexibility and stability. Often used by (initially) high inflation countries pegging to low inflation countries in an attempt to avoid trend real appreciation. <strong>Potential costs:</strong> At the margins, a crawling peg provides a target for speculative attacks. Among variants of fixed exchange rates, it imposes the least restrictions, and may hence yield the smallest credibility benefits. The credibility effect depends on accompanying institutional measures and record of accomplishment. <strong>Issues:</strong> Exit strategy, either to harder peg, or greater flexibility.</td>
</tr>
<tr>
<td>Bands</td>
<td><strong>Key feature:</strong> Exchange rate is flexible within a preset band; endpoints defended through intervention, typically with some intra-band intervention. An attempt to mix market-determined rates with exchange rate stabilizing intervention in a rule based system. <strong>Potential benefits:</strong> Provides a limited role for exchange rate movements to counteract external shocks and partial expectations anchor, retains exchange rate uncertainty and thus motivates development of exchange rate risk management tools. <strong>Potential drawbacks:</strong> On the margin, a band is subject to speculative attacks. Does not by itself place hard constraints on monetary and fiscal policy, and thus provides only partial solution against the time inconsistency problem. The credibility effect depends on accompanying institutional measures and record of accomplishment.</td>
</tr>
<tr>
<td>Float with discretionary intervention</td>
<td><strong>Key feature:</strong> Exchange rates are determined in the foreign exchange market. Authorities can and do intervene, but are not bound by any intervention rule. Often accompanied by a separate nominal anchor, such as an inflation target. <strong>Potential benefits:</strong> The arrangement provides a way to mix market determined rates with exchange rate stabilizing intervention in a non-rule-based system. <strong>Potential drawbacks:</strong> Does not place hard constraints on monetary and fiscal policy. Absence of rule conditions credibility gain on credibility of monetary authorities. Limited transparency.</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Pure Float</td>
<td><strong>Key feature:</strong> The exchange rate is determined in the market without public sector intervention. <strong>Potential benefits:</strong> Adjustments to shocks can take place through exchange rate movements. Eliminates the requirement to hold large reserves. <strong>Potential drawbacks:</strong> Does not provide an expectations anchor. Exchange rate regime places no restrictions on monetary and fiscal policy; time inconsistency problem arises unless addressed by other institutional measures.</td>
</tr>
</tbody>
</table>

**Classification Approaches**

Intuitively, a pegged exchange rate is one whose value, in terms of some reference currency or commodity (usually gold), does not vary, or varies only within narrow, pre-defined limits. But an exchange rate peg is much more than that since it implies a formal commitment by the central bank to maintain the parity through foreign exchange intervention and, ultimately, through the subordination of its monetary policy to the exchange rate objective if necessary. In a floating regime, by contrast, the central bank undertakes no such commitment.

This suggests that the exchange rate regime might be best defined by the stated intentions of the central bank (which every IMF member country is required to report and publish each year), yielding a *de jure* classification. The classification emphasizes the importance of public pronouncements as a signal for the private sector’s expectations. Pushed to its extreme, the implication is that, in comparing two countries with identical histories, the announced exchange rate regime still matters because it conveys information about future policy intentions, thus influencing expectations and outcomes.

But what is one to make of a putative fixed exchange rate that is devalued each year (if not more frequently)? Recalcitrant governments have been known to abuse the credibility benefits of fixing the exchange rate, pursuing expansionary policies that are inconsistent with maintaining the peg (Tornell and Velasco (1995,2000)). Clearly, if the central bank does not take its commitment to defend the parity very seriously, it is not much of a fixed exchange rate regime. Conversely, if the central bank—while abjuring any formal commitment—nevertheless intervenes heavily in the foreign exchange markets, then the exchange rate can hardly be described as a freely floating.¹

To the extent that there is a sizable number of such “soft pegs” and “hard floats”, classifying countries solely according to their declared regime may give misleading results.
An alternative _de facto_ classification scheme, therefore, uses the observed behavior of the nominal exchange rate (and perhaps indicators of monetary policy) to define the exchange rate regime.2

De facto classifications are not without their own drawbacks, however. Foremost among these is their essentially backward-looking nature. While the stated regime in principle conveys information about future policy intentions, observed actions necessarily pertain to the past. Again taken to its extreme, the de facto approach implies that a country announcing an exchange-rate based disinflation program—even if fully credible—would derive no credibility benefit in terms of lowering inflationary expectations. While ultimately an empirical question, the assumption seems at odds with much of modern macroeconomic theory, which emphasizes the importance of expectations.

Beyond this fundamental concern, de facto measures must contend with a number of conceptual difficulties and practical problems. Stability of the nominal exchange rate—typically the most significant component of de facto measures—may reflect either an absence of shocks or an active policy offsetting shocks; only the latter warrants inferences about policy. More generally, since countries have different structures and are subject to different shocks, it is difficult to infer the underlying exchange rate policy from the observed exchange rate movement. For example, a small open economy with a narrow export base operating under a pure float will likely experience greater exchange rate volatility than a larger, more diversified economy also operating under a pure float. Since de facto measures are inherently relative—countries have “more” or “less” fixed exchange rates3—the small country might be (correctly) classified as floating, while the larger country might be (incorrectly) assigned to the “fixed” category.

In principle, identification can be achieved by controlling for country characteristics (Calvo and Reinhart (2000), Levy-Yeyati and Sturzenegger (1999)) and by incorporating foreign exchange intervention or interest rate movements in the de facto classification.4 In practice, neither is straightforward. Interest rates in many developing countries are set administratively; often bearing little relation to what would be the market clearing rates. More importantly, central banks typically treat intervention data as confidential; information is not available on a consistent basis for large, cross-country data sets.5

Some studies use the change in gross reserves as a proxy for intervention, which has serious drawbacks. Just as intentions and actions may differ for the exchange rate regime, so statistics and reality might diverge for data on foreign exchange reserves. As the use of forward markets, swaps, non-deliverable forwards and a variety of other off-balance sheet instruments by central banks have become more commonplace, gross reserves— even if reported accurately—become ever less revealing.6 Furthermore, movements in central bank reserves, particularly in low income countries, are also influenced by a plethora of other factors. These might include servicing of foreign debt or payments for bulky purchases such as oil imports or aircraft, which have little to do with intentional foreign exchange intervention but result in large movements in reported reserves.7
A more fundamental identification problem concerns the distinction between intervention undertaken to meet an explicit exchange rate target, and intervention motivated by other policy objectives. Inflation-targeting regimes are a case in point. In a small open economy that is subject to significant exchange rate pass-through to domestic prices, an inflation-targeting framework might place considerable weight on exchange rate stability in the face of nominal shocks — thus yielding a low de facto score of exchange rate flexibility. However, the same framework may dictate considerable exchange rate adjustment in the face of real shocks. Depending on the relative incidence of real and nominal shocks, a de-facto scheme may thus classify an inflation-targeting regime as either fixed or flexible. Moreover, as the incidence of shocks varies across time or countries, so will the de facto classification, even though the underlying policy regime remains the same.

Ultimately, neither the de jure nor the de facto method is ideal. De jure classifications focus on the stated policy intentions of the monetary authorities; difficulties arise when policy practices diverge from promises. De facto classifications are based on actual movements of the exchange rate (and sometimes, other variables), but are backward-looking and may capture exchange rate policy very imperfectly.

In our judgment, the drawbacks of the de jure classification are less severe. Most countries claiming to operate under fixed exchange rate regimes indeed maintain stable exchange rates over prolonged periods, while most countries claiming to have floating regimes experience substantial exchange rate variability, albeit occasionally tempered by large foreign exchange interventions. Accordingly, we prefer to use the de jure classification as our main method for categorizing regimes.

Notwithstanding this preference, several studies suggest that there are at least some cases of soft pegs and hard floats (particularly among emerging market countries). To examine the robustness of our findings to classification problems, we complement our de jure classification with a “consensus” classification. This sample consists only of those countries that are classified in the same category (fixed, intermediate, or floating) by both the de jure measure and by a de facto measure that we construct. In essence, the consensus sample drops “hard” floats and “soft” pegs. To preview the results, eliminating these ambiguous cases does not materially affect our findings on inflation performance, but it is of greater importance when we get to the results on economic growth.

The De Jure Classification

Our de jure classification is based on the stated intentions of the monetary authorities, as reported in the International Monetary Fund’s Annual Report on Exchange Arrangements and Exchange Restrictions. Table 1.2 lists the reported exchange rate regimes, along with their relative frequencies for virtually all IMF member countries from 1970 to 1999, some 4,300 observations covering 167 countries.

<table>
<thead>
<tr>
<th>Table 1.2: De Jure Classification of Exchange Rate Regimes 1970-99</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in percent of total observations)</td>
</tr>
</tbody>
</table>

---


<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pegged Regimes</strong></td>
<td>65.4</td>
<td>84.8</td>
<td>68.4</td>
<td>46.6</td>
</tr>
<tr>
<td>(1) Hard Pegs</td>
<td>13.2</td>
<td>10.0</td>
<td>13.8</td>
<td>15.4</td>
</tr>
<tr>
<td>Dollarized</td>
<td>0.6</td>
<td>0.5</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Currency Board</td>
<td>5.2</td>
<td>4.6</td>
<td>4.7</td>
<td>6.1</td>
</tr>
<tr>
<td>Monetary Union</td>
<td>7.4</td>
<td>4.9</td>
<td>8.4</td>
<td>8.7</td>
</tr>
<tr>
<td>(2) Single Currency Pegs</td>
<td>32.8</td>
<td>61.2</td>
<td>61.2</td>
<td>27.4</td>
</tr>
<tr>
<td>(3) Basket Pegs</td>
<td>19.4</td>
<td>13.6</td>
<td>27.1</td>
<td>17.2</td>
</tr>
<tr>
<td>Published Basket Pegs</td>
<td>9.8</td>
<td>7.3</td>
<td>13.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Secret Basket Pegs</td>
<td>9.6</td>
<td>6.2</td>
<td>13.3</td>
<td>9.1</td>
</tr>
<tr>
<td><strong>Intermediate Regimes</strong></td>
<td>20.4</td>
<td>11.0</td>
<td>22.5</td>
<td>26.4</td>
</tr>
<tr>
<td>(4) Floats with Rule-based Intervention</td>
<td>8.4</td>
<td>5.9</td>
<td>9.5</td>
<td>9.6</td>
</tr>
<tr>
<td>Co-operative Regimes (EMS)</td>
<td>5.2</td>
<td>3.8</td>
<td>5.7</td>
<td>6.0</td>
</tr>
<tr>
<td>Crawling Pegs</td>
<td>1.4</td>
<td>1.1</td>
<td>1.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Target Zones and Bands</td>
<td>1.0</td>
<td>0.5</td>
<td>1.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Unclassified Rule-based Systems</td>
<td>0.7</td>
<td>0.5</td>
<td>0.8</td>
<td>0.9</td>
</tr>
<tr>
<td>(5) Floats with Discretionary Intervention</td>
<td>12.0</td>
<td>5.1</td>
<td>13.0</td>
<td>16.8</td>
</tr>
<tr>
<td>Managed Floating w. Heavy Intervention</td>
<td>1.4</td>
<td>0.5</td>
<td>3.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Unclassified Managed Floating</td>
<td>8.1</td>
<td>0.8</td>
<td>6.1</td>
<td>16.1</td>
</tr>
<tr>
<td>Other Floats</td>
<td>2.4</td>
<td>3.8</td>
<td>3.7</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Floating Regimes</strong></td>
<td>14.2</td>
<td>4.3</td>
<td>9.1</td>
<td>27.0</td>
</tr>
<tr>
<td>(6) Floats</td>
<td>14.2</td>
<td>4.3</td>
<td>9.1</td>
<td>27.0</td>
</tr>
<tr>
<td>Floating with Light Intervention</td>
<td>1.5</td>
<td>1.1</td>
<td>2.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Floating with no Intervention</td>
<td>12.7</td>
<td>3.2</td>
<td>6.5</td>
<td>26.2</td>
</tr>
<tr>
<td><strong>Total observations</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total observations in proportion of full sample</strong></td>
<td>100</td>
<td>30.4</td>
<td>30.4</td>
<td>33.1</td>
</tr>
</tbody>
</table>
At its most detailed level, the classification comprises fifteen regimes ranging from hard pegs, such as currency boards and dollarization, to intermediate regimes such as crawling pegs and target zones, and finally floats with varying degrees of intervention.\textsuperscript{12} Single currency pegs are the largest group; accounting for almost a third of the observations, followed by basket pegs and managed floats. Over the entire sample, a little more than a quarter of the observations, divided roughly equally, fall into the two “extreme regimes” of hard pegs and pure floats.

Fifteen regimes is too fine a classification for most questions; for the bulk of our empirical analysis, we condense regimes into three groups: pegged, intermediate and floating. Their respective compositions are indicated in bold type in Table 1.2. The rightmost columns report the frequency distributions by decade. Over the sample period, the prevalence of pegged regimes has declined sharply, from eighty-five percent of all observations during the 1970s to less than fifty percent by the 1990s. The sharpest gains were recorded by the floating group, increasing from a mere four percent in the 1970s to more than twenty-five percent during the 1990s (Figure 1.1).\textsuperscript{13}

On occasion, we also make use of a more detailed, six-way classification subdividing the pegged regimes into hard pegs, single currency pegs and basket pegs; intermediate systems into those with publicly known or rule-based intervention (crawling pegs and target zones) versus those with more discretionary intervention; with floats forming the final category. Table 1.2 reports the composition of this finer classification, in italic type.

The time pattern for the more detailed classification (Figure 1.2) shows that the traditional single currency peg has lost market share, shrinking from sixty percent of observations to less than fifteen percent over the sample period. Winners include the pure floats and floats with discretionary intervention, increasing from nine percent to almost forty-four percent, while hard pegs display a more modest increase from ten to fifteen percent.

\textit{Consensus Classification}

Since policy actions sometimes differ from stated intentions—most notably in the case of soft pegs and hard floats—it is useful to complement the de jure classification with one based on observed behavior. To this end, we construct a “consensus classification” which essentially drops soft pegs and hard floats by using the intersection of the de jure classification and a de facto classification that we construct.

We first compute a continuous de facto measure based on observed exchange rate behavior, then convert it into a discrete three-way classification of pegged, intermediate, and floating regimes using the relative frequency distribution of regimes in the de jure classification. The consensus sample then simply consists of all observations for which the two classification methods agree.
The most obvious variable on which to base the de facto measure is the nominal exchange rate itself. As discussed above, stability of the nominal exchange rate may however reflect either a deliberate policy of keeping the exchange rate fixed, or an absence of shocks. One option is to augment the measure by incorporating variables such as interest rates and the change in reserves as proxies for intervention (Calvo and Reinhart (2000), Kaminsky and Schmukler (2001), Levy-Yeyati and Sturzenegger (1999)).

We pursue the simpler approach of using the variability of the nominal exchange rate as the de facto measure, for two reasons. First, our interest lies not in the de facto classification as such, but rather in constructing a robustness check for our empirical results obtained using the de jure classification. Second, the methodological problems identified above are, in our view, too severe to justify the loss of sample size implied by trying to add reserve and interest rate movements to the de facto measure.

Even for our relatively simple de facto measure, several issues must be addressed. First, how should exchange rate volatility be measured? Second, against which reference currency should the volatility be assessed? Figure 1.3 plots examples of two idealized types of nominal exchange rate movement——a crawling peg, and a float without trend——together with their combination (a float with a trend). While the float with trend is clearly the most volatile, it is less clear how to rank the crawling peg relative to the float without trend. The crawling peg is more predictable, yet the average movement during the year (end point to end point) may well exceed that of a pure float without trend.

For our de facto measure, we attach equal weight to both features, creating an annual score based on the mean and variance of the monthly depreciation rates. The continuous de facto measure is given by \( z = \sqrt{\mu_{\Delta e}^2 + \sigma_{\Delta e}^2} \), where \( \mu_{\Delta e} \) is the average monthly rate of change of the nominal exchange rate during the year, and \( \sigma_{\Delta e}^2 \) is the variance of those monthly changes. For each country in the sample, we compute this measure separately against each of the G-7 currencies, the ECU and the SDR, and then select the reference currency yielding the smallest Z score.\(^{14}\)

To construct a discrete de facto measure comparable to the de jure classification, we drop the (very small) number of observations for which either the de jure or the de facto measure is unavailable. For each sample year, we then map the continuous score into three de facto regimes (pegged, intermediate, and float) by imposing the relative frequency distribution of the de jure classification for that year.\(^{15}\)

\(* A Comparison *

The de jure and the de facto classifications are supposed to capture the same concept — the nominal exchange rate regime. If most governments do what they say and say what they do, one would thus expect substantial overlap. Table 1.3 compares the de jure and de facto classifications. Along the diagonal of the matrix, both classifications coincide; off-
diagonal elements represent divergences between the two classifications. The overlap is
greatest for the pegs (where almost seventy percent are classified in the same way), whereas
the distinction between floats and intermediate regimes is hazier. Overall, the overlap is
substantial: almost 65 percent of the observations are classified identically under the two
schemes. These observations constitute the “consensus” subsample that we will use below
for our robustness tests.

Table 1.3: Distribution of De Jure and De Facto Classifications

<table>
<thead>
<tr>
<th>De Jure Classification</th>
<th>De Facto Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pegged Regimes</td>
<td>2265</td>
</tr>
<tr>
<td>Intermediate Regimes</td>
<td>432</td>
</tr>
<tr>
<td>Floating Regimes</td>
<td>124</td>
</tr>
<tr>
<td>Total</td>
<td>2821</td>
</tr>
<tr>
<td>Percentage Consensus</td>
<td>80.3</td>
</tr>
</tbody>
</table>

The off-diagonal entries provide an indication of the importance of soft pegs and hard
floats. Conditional on the de facto classification being correct, soft pegs are observations
classified as de jure pegs but de facto floats. There are 178 observations in this category (6
percent of all de jure pegs), while a further 378 (13 percent of all de jure pegs) are classified
as intermediate regimes under the de facto classification. At the other end of the spectrum, de
jure floats that behave like de facto pegs —hard floats or “fear of floating” cases— account
for 124 observations (about 20 percent of all de jure floats). A further 233 observations (or
38 percent of de jure floats) would be classified as an intermediate regime under the de facto
classification.

Classifications: Conclusions

Most theoretical analyses rely on a simple dichotomy between “fixed” and “floating”
exchange rates. Empirical work does not enjoy that luxury. The rich diversity of regimes
poses two challenges for empirical work: how fine a classification scheme to adopt, and how
to classify individual countries.

Trying to squeeze the various regimes into a rigid dichotomization of “fixed” versus
“flexible” regimes risks losing important distinctions. On the other hand, too detailed a
classification risks loosing sight of the forest among the trees. We strike a compromise, using
both a broad three-way classification (corresponding to the intuitive notion that countries
might have “fixed” or “floating” exchange rate regimes, or an intermediate arrangement) as well as a more detailed, six-way classification that allows us to distinguish, for instance, between hard pegs and traditional, adjustable pegs, or between pegs against secret- versus published baskets.

The second issue concerns the identification of regimes. Are regimes best classified by words -- the stated commitment of the central bank-- or by actions and behavior, most notably of the nominal exchange rate? There is no clear answer; both approaches have their advantages and drawbacks. We prefer the de jure approach, both because of the central role of signaling and expectations formation in modern macroeconomics, and because of the significant conceptual and practical problems associated with de facto classifications. Nevertheless, as a robustness check, we also create a consensus classification that aims to drop the ambiguous cases -- soft pegs and hard floats -- to examine the sensitivity of our main results to the classification methodology.

**Consequences**

Based on the classification reported above, do exchange rate regimes matter for performance? We examine this issue for prices and output, beginning with a baseline specification before turning to a range of robustness tests.

**Inflation**

To examine the conditional link between inflation and the exchange rate regime we regress the scaled inflation rate $\pi/(1+\pi)$ (which we shall simply refer to as “inflation,” $\pi$, in what follows) on two exchange rate regime dummies for pegged ($Peg$) and intermediate ($Int$) regimes respectively. Floating regimes are the excluded category (so that the coefficients on $Peg$ and $Int$ should be interpreted as the inflation differential relative to a floating exchange rate regime). Of course, inflation is likely to depend on much more than just the exchange rate regime. Higher real GDP growth, $\Delta y$, by raising money demand, should reduce inflation. Conversely, faster growth of the money supply, $\Delta m$, should be associated with higher inflation. Romer (1993) argues that greater trade openness (the ratio of exports plus imports to GDP, $Open$) raises the costs of a monetary expansion, which, by the logic of the policy credibility models, should imply lower inflation in more open economies.\(^{16}\)

The policy credibility literature suggests that an independent, “conservative” central banker can help solve the time consistency problem (Rogoff, 1985). Although it is difficult to measure the conservatism of the central bank governor, Cukierman (1992) uses the turnover rate ($CBTN$) of the central bank governor as an (inverse) proxy for central bank independence, on the grounds that less independent central bank governors can be fired more easily. A higher turnover rate of the central bank governor should therefore be associated with higher inflation. Other factors include inflationary terms-of-trade shocks ($TofT$) [Fischer (1993)] and the fiscal balance ($Gov. Bal.$), either because of direct money financing, or simply by contributing to aggregate demand pressures.
In addition, we include annual dummies in the regression to capture shocks that are common across countries, but vary over time, such as oil price shocks. The baseline equation therefore becomes:  

$$\pi = \beta_0 + \beta_{\text{ Peg}} \text{ Peg} + \beta_{\text{ Int}} \text{ Int} + \beta_{\text{ slow}} \text{ slow} \Delta m + \beta_4 \text{ Delta} + \beta_5 \text{ OPEN} + \beta_6 \text{ CB Turn} + \beta_7 \text{ Delta T} + \beta_8 \text{ Gov. Bal.} + \varepsilon$$

To interpret the results, we need to take account of the possibility that money growth itself is endogenous to the nominal exchange rate regime. Since money growth is included as one of the conditioning variables in the regression, any indirect effects of the exchange rate regime operating through money growth would not be picked up by the coefficients on the regime dummies. To illustrate, suppose that the growth rate of the money supply depends upon the exchange rate regime:

$$\Delta m = \alpha_0 + \alpha_{\text{ Peg}} \text{ Peg} + \alpha_{\text{ Int}} \text{ Int} + \eta$$

where $\text{ Peg}$ and $\text{ Int}$ are dummy variables for pegged and intermediate regimes, and $\eta$ is a random shock. Suppose further that the inflation rate depends upon money growth, the exchange rate regime, and a vector of other conditioning variables, $z$:

$$\pi = \beta_0 + \beta_{\text{ Peg}} \text{ Peg} + \beta_{\text{ Int}} \text{ Int} + \beta_{\text{ slow}} \text{ slow} \Delta m + \beta_j z_j + \varepsilon$$

The direct effect of the exchange rate regime on inflation, conditional on money growth—what we termed the “confidence effect” above—is given by the coefficient $\beta_{\text{ Peg}}$ ( $\beta_{\text{ Int}}$ for intermediate regimes). From (1), however, there is also an indirect effect on inflation through the money growth channel, given by $\beta_{\text{ slow}} \alpha_{\text{ Peg}}$. Since Peg is a dummy variable, an estimate of $\alpha_{\text{ Peg}}$ is given by the difference in the average growth rates of the money supply under pegged and floating regimes: $\alpha_{\text{ Peg}} = \overline{\Delta m_{\text{ Peg}}} - \overline{\Delta m_{\text{ Flt}}}$ (and likewise for $\alpha_{\text{ Int}}$). The full effects of the exchange rate regime on inflation, combining the confidence and discipline effects can therefore be obtained from (2) as $\gamma_{\text{ Peg}} = \beta_{\text{ Peg}} + \beta_{\text{ slow}} (\overline{\Delta m_{\text{ Peg}}} - \overline{\Delta m_{\text{ Flt}}})$, below we report both the confidence effect, $\beta_{\text{ Peg}}$, and this combined effect, $\gamma_{\text{ Peg}}$.  

Table 2.1 reports the coefficients for alternative samples. Panel 1 refers to the de jure classification of exchange rate regimes, and Panel 2 to the consensus classification. Within each panel, the coefficients on the regime dummies in the first column capture the sum of the confidence and the discipline effects [ $\gamma_{\text{ Peg}} = \beta_{\text{ Peg}} + \beta_{\text{ slow}} (\overline{\Delta m_{\text{ Peg}}} - \overline{\Delta m_{\text{ Flt}}})$ ]. The coefficient in the second column reports the confidence effect alone [ $\beta_{\text{ Peg}}$ ]. The difference between the two columns thus captures the discipline effect.

The various independent variables enter the regression with the expected signs and are statistically significant (with the exception of the terms of trade). Faster money growth and
lower GDP growth are associated with higher inflation, while more open economies, countries with larger fiscal balances, and those with more independent central banks exhibit lower inflation.

Turning to the exchange rate regime dummies, inflation under pegged regimes is 10½ percentage points per year lower than under floating regimes, of which about 4½ percentage points are associated with lower money growth, and the remaining 5½ percentage points represent the “confidence” effect. At 13½ percentage points, the inflation differential vis-à-vis intermediate regimes is larger.

From Panel 2 of Table 2.1, under the consensus classification, the difference in inflation rates between pegged and floating regimes is twice as large—almost 22 percentage points per year (of which 7 percentage points are associated with lower money growth, and 14 percentage points with greater confidence). Taken together, the results suggest that, by pegging their exchange rate, countries can improve their inflation performance substantially, with the full anti-inflationary benefits—particularly through the confidence channel—accruing to those countries that maintain a hard peg and avoid frequent devaluations.

Differentiating across the three income groups, the results are weakest for the upper income (industrialized) countries, for which the differences in inflation rates across regimes are negligible and statistically insignificant. One possible explanation is that these countries have strong institutional frameworks and enjoy low inflation rates anyway, so that the exchange rate regime makes little difference.

This is borne out by splitting the full sample into low inflation observations (those below 10 percent per year) and high inflation observations (those above 10 percent per year), and re-estimating the regression for the two subsamples. As Table 2.2 indicates, the difference in inflation between pegged and floating regimes holds at inflation rates above 10 percent per year, but not below. (The cut-off of 10 percent per year is just about right: if the low inflation sample is defined to include inflation rates of 12 percent per year or below, the coefficient on the Peg dummy becomes negative and statistically significant).

Table 2.2 also reports regressions for a variety of other sub-samples each capturing alternative ways (other than the exchange rate regime) through which countries can gain policy credibility. These samples include countries with no current account restrictions (IMF Article VIII countries), countries with no capital controls (as defined by the IMF’s Annual Report on Exchange Arrangements and Restrictions), countries with especially low rates of turnover of the central bank governor, and countries that are particularly open to international trade.

For countries without current account restrictions, high trade openness ratios, or low central bank turnover rates, the difference in inflation performance between pegged and floating regimes remains. Abjuring capital controls, on the other hand, does seem to provide an alternative means of gaining policy credibility. Inflation in these countries averages less than 10 percent per year, and the de jure exchange rate regime makes only a marginal
difference to their inflation performance (in the consensus classification, however, the difference remains pronounced, at about 17 percentage points per year).

**Inflation: Extensions and Robustness Tests**

The results suggest a rather strong link between the exchange rate regime and inflation performance. In this section, we check whether the results are robust to a variety of different econometric specifications, and to controlling for the potential endogeneity of the regime itself.

**A Finer Classification**

We begin by disaggregating the three de jure exchange rate regimes into their more detailed six-way classification: hard pegs, single currency pegs, basket pegs, rule-based flexible systems, floats with discretionary intervention, and pure floats. We include dummies for the first five regimes, leaving pure floats as the omitted category. The coefficients on the regime dummies, reported in Table 2.3, should thus be interpreted as inflation differentials relative to a pure float.

Hard pegs (currency boards and dollarization) perform best, with a 15 percentage point inflation differential vis-à-vis pure floats, split roughly equally between the discipline and confidence effects. Basket pegs do somewhat better than single currency pegs. The confidence effect, however, is slightly greater for the latter, consistent with the view that, compared to basket pegs, the transparency and simplicity of a single currency peg should foster greater confidence (Frankel, Schmukler, and Servén, 2000b).

Notwithstanding the general tendency for inflation to be higher under more flexible regimes, average inflation under pure floats is some 8 percent per year lower than under floating regimes with discretionary intervention. This gives some support to the contention that “extreme regimes”—strict pegs or pure floats—perform particularly well. Alternatively, the finding may be an indication that countries with generally good macroeconomic fundamentals can better afford to allow their exchange rate to float freely (whether endogeneity of regime choice can account for the good inflation performance of pegged regimes is taken up below). Otherwise, the results for this more detailed classification are very much consistent with those for the three-way categorization into pegged, intermediate, and floating regimes.

**Contamination**

Are the results driven by “contamination” across regimes? For example, fixing the exchange rate may allow the government to “cheat,” delivering apparently good inflation
performance during its tenure while leaving a legacy of a collapsing peg and high inflation to its successors. (At least in the de jure classification, fiscal deficits have on average been larger under pegged regimes.) If so, using the contemporaneous exchange rate classification would inappropriately attribute inflation that had developed under the pegged regime to the subsequent floating period.

The problem can be addressed either by dropping the first few years following any regime change from the dataset or, more stringently, by reclassifying the first few years of any floating regime under the previous peg. An alternative is to drop the fiscal balance from the regression, on grounds that pegged regimes might be associated with larger deficits, and that by conditioning on the deficit, this channel for pegged exchange rates to adversely affect inflation is being purged from the regression. As specifications [1]-[4] in Table 2.4 indicate, none of the modifications changes the qualitative results--pegged regimes continue to exhibit both confidence and discipline benefits.

**Fixed Effects**

Does the association between pegged regimes and low inflation stem from the sample’s cross-section dimension, from its time dimension, or both? Results coming from only one of these dimensions would be less compelling.

The panel results suggest that countries operating under pegged rates have lower inflation on average. This does not imply, however, that a country switching from a floating to a pegged regime will enjoy a lower inflation rate (even ignoring transitional dynamics) as the results could be driven entirely by country-specific factors. To address this possibility, we re-estimate the panel regression, including country-specific fixed effects.

As the fifth panel in Table 2.4 shows, the imputed effect of the exchange rate regime does indeed become somewhat smaller. The total inflation differential between pegged and floating regimes declines from 10½ to 7 percentage points per year in the de jure classification, and from 21½ to 15 percentage points per year in the consensus classification. In both cases, however, the coefficients remain highly significant.

**Endogeneity of Regime Choice**

The above results all suggest that countries operating under pegged exchange rate regimes enjoy lower inflation. However, whether a country adopts, or maintains, a pegged exchange rate might itself depend upon its inflation performance. If countries that have low inflation are also more likely to maintain a pegged exchange rate, then the coefficient on the pegged regime dummy is subject to simultaneity bias.

To address this issue, we develop a simultaneous equation framework that explicitly allows for the endogeneity of regime choice. Inflation is assumed to depend upon whether
the country has an exchange rate peg, Peg, and a vector of other characteristics, \( z \), comprising the independent variables included in the regressions reported above:

\[
\pi = z' \beta + \gamma, Peg + \eta
\]  

(3)

The decision to peg is assumed to depend upon the inflation rate, as well as other country characteristics, \( z_2 \):  

\[
Peg^* = z_2' \beta_2 + \gamma_2 \pi + \eta_2
\]  

(4)

\( Peg^* \) is an unobserved “desire” to peg the exchange rate and \( \eta \) captures non-systematic factors. \( Peg = 1 \) if, and only if, \( Peg^* > 0 \). If \( \gamma_2 < 0 \) (countries with high inflation are less likely to maintain an exchange rate peg), then the anti-inflationary benefit of pegging, as estimated above, is overstated.

Using the simultaneous equation framework, we can estimate the residual effect of a pegged exchange rate regime on inflation, controlling for the endogeneity of the choice of regime. We first estimate the fully reduced form of the regime choice [obtained by substituting (3) into (4)]:

\[
Peg = z \beta + \eta
\]  

(5)

where \( z = [z_1, z_2] \) includes all of the independent variables, and \( \eta \) is a composite error term. The predicted values for \( Peg \) from this probit are then substituted into the semi-reduced form of the inflation regression (3) with the appropriate correction for the standard error (Maddala (1989)).

In principle, the non-linearity of the probit function is sufficient for identifying the inflation regression; in practice, an explicit exclusion restriction makes a more compelling case for identification. We use two restrictions, on country size and on export concentration. The literature on exchange rate regime choice suggests that smaller countries and countries with more geographically concentrated exports tend to have a pegged exchange rate. There is, however, little reason to believe that either country size or export concentration influences inflation.

Since it is difficult to find plausible instruments that distinguish between pegged and intermediate regimes, we use a dichotomous classification (for this section only), grouping intermediate and floating regimes together. The inflation regression is thus not comparable to the results reported above, where intermediate and floating regimes were separated. To provide a benchmark, we first re-estimate the simple OLS regression for this dichotomous classification. The results, given in the bottom panel of Table 2.5, indicate a differential of 12 percentage points per year in favor of pegged regimes (and 13½ percentage points per year under the consensus classification).
Turning to the simultaneous equation framework, it is reassuring to note that, as hypothesized, smaller countries and countries with greater geographic concentration of exports are more likely to have an exchange rate peg (Table 2.5, top panel). In all, the probit correctly predicts some 70-80 percent of the observations.

The second-stage inflation regression suggests that the OLS estimates may indeed be subject to some simultaneity bias. In the two-stage simultaneous equation framework, the inflation differential in favor of pegged regimes falls from 11.7 to 8.1 percentage points per year for the de jure, and from 13.5 to 9.8 percentage points per year for the consensus classifications. Nonetheless, the benefit of pegged regimes for lowering inflation remains both economically and statistically significant.

INFLATION: CONCLUSIONS

Is the exchange rate regime linked to inflation? The results are compelling. Inflation is lower under pegged exchange rates, reflecting both lower money growth (the discipline effect) and greater confidence in the currency (the credibility effect). The results are robust across a range of sub-samples. They are also robust to using different definitions of exchange rate regimes, allowing for cross-regime contamination, and controlling for the potential dependence of the regime choice on inflation.
References


Levy Yeyati, Eduardo, and Federico Sturzenegger, 2001a, “To Float or to Trail”, mimeo, Universidad Torcuato Di Tella, Buenos Aires.


Endnotes

3. Levy-Yeyati and Sturzenegger (1999) use an endogenous clustering approach combining “similar” observations into groups. Other approaches impose a priori thresholds on a single aggregated de facto score. Neither approach corresponds closely to theoretical concepts (nor does our de facto classification rule, described below).
4. While direct intervention is the more common tool, changes in interest rates or in domestic credit expansion can also be used to affect the exchange rate in the face of shocks, and may thus deserve a role in de facto classifications. See Calvo and Reinhart (2000a) for a careful analysis along these lines.
5. See Ghosh (2002) for an analysis of central bank incentives to intervene secretly.
6. In a number of recent exchange rate crises, assumptions of the private sector (and even the IMF) about the true level of usable reserves were later revealed to be spectacularly wrong as the monetary authorities in these countries had engaged in large, off-balance sheet transactions (or had otherwise encumbered their reserves) in the run-up to the crises.
7. While official payments and receipts can be excluded from reserves (Levy-Yeyati and Sturzenegger (1999)), other outliers, including bulky trade transactions, are more difficult to allow for.
9. It is interesting to note in this context that Levy-Yeyati and Sturzenegger (2001a,b), using a de facto measure, find different growth results compared to earlier results of Ghosh, Gulde, Ostry, Wolf (1995) who use the de jure classification, while their results for inflation are more similar.
10. Under the Second Amendment of the IMF’s Articles of Agreement, member countries are free to choose their exchange rate regime, but are required to inform the IMF of their choice, and to promptly report any changes to their exchange rate arrangements.
11. The Appendix provides a more detailed description of the data set.
12. Intervention frequency is based on assessments by IMF country desk officers and on summaries of the implementation of exchange rate regimes contained in annual IMF country documents.
13. The uptick in pegged regimes in 1999 reflects the shift from the EMS system (classified as intermediate) to EMU (classified as a peg).
14. For the G5 countries, we drop their own currency. For the small set of countries reporting a de jure peg vis-à-vis a currency not in this group, we added the currency in question (the South African Rand, the Indian Rupee, the Spanish Peseta, the Australian Dollar and the Portuguese Escudo) to the search for that particular country. The Z scores are clustered around zero with a long declining right-hand tail peaking at about 1½ percent per month.
15. As discussed above, there is no fully satisfactory way of mapping the continuous score into a discrete classification. Our identification is based on the assumption that the overall frequency distribution of the de jure regimes (given the partial offset between hard floats and soft pegs) is reasonably accurate.
17. To control for potential endogeneity, money growth, real GDP growth, and the fiscal balance are instrumented using their lagged values; t-statistics are computed using White heteroscedastic consistent standard errors.
18. The coefficient on money growth is constrained to be equal across regimes. An alternative formulation would allow for a differential impact of money growth on inflation, depending upon the exchange rate regime: $\pi = \beta_0 + \beta_{s\text{ Peg}} \text{ Peg} + \beta_{m\text{ Int}} \text{ Int} + \beta_{\text{ Peg} \times \Delta m} \text{ Peg} \times \Delta m + \beta_{m\text{ Peg} \times \Delta m} \text{ Peg} \times \Delta m + \beta_{m\text{ Peg} \times \Delta m} \text{ Peg} \times \Delta m + \ldots + \varepsilon$
19. We assume that any other determinants of money growth in (1) are uncorrelated with $\gamma_{\text{ Peg}}$ and $\text{Int}$. The standard error of $\gamma_{\text{ Peg}}$, SE ($\gamma_{\text{ Peg}}$), is calculated from the variance-covariance matrix of $\beta_{\text{ Peg}}$ and $\beta_{\text{ money}}$, treating $\Delta m_{\text{ Peg}} - \Delta m_{\text{ Fld}}$ as known, and the reported t-statistic is simply the ratio $\gamma_{\text{ Peg}} / \text{SE} (\gamma_{\text{ Peg}})$.

20. Conditional on money growth, the effect of the pegged exchange rate regime is given by $\beta_{\text{ Peg}}$, as before. The unconditional coefficient, however, now becomes $\gamma_{\text{ Peg}} = \beta_{\text{ Peg}} + \beta_{\text{ Mon}} \Delta m_{\text{ Peg}} - \beta_{\text{ Mon}} \Delta m_{\text{ Fld}}$. Estimating this alternative regression yields $\beta_{\text{ Peg}} = 0.125$ (t-stat.: 2.89***), and $\beta_{\text{ Mon}} = 1.00$ (t-stat.: 9.57***); since $\beta_{\text{ Peg}} < \beta_{\text{ Mon}}$, the inflation differential in favor of pegged regimes (unconditional on money growth) becomes larger, while the conditional effect, $\beta_{\text{ Peg}}$, remains roughly the same.

21. The consensus sample drops de jure pegs with high exchange rate volatility and de jure floats with low exchange rate volatility. Inasmuch as greater exchange rate volatility is associated with higher average inflation, the consensus sample tends to drop the de jure pegs with the highest and the de jure floats with the lowest inflation rates—thereby widening the estimate inflation differential. Levy-Yeyati and Sturzenegger (2001b), using a de facto classification, find that the inflation advantage of fixed exchange rates derives primarily from durable pegs in low- and moderate-income countries.


23. Note that only the coefficients on country size and export concentration are identified, since these variables do not enter the inflation regression. To identify the other coefficients of the semi-reduced form (4) from the estimated fully-reduced form (5) would require some additional identifying restrictions.

24. An alternative approach to the issue of regime endogeneity is to compare the performance of countries that switched from floating to pegged regimes: in the three years following the adoption of the peg, median inflation was some 15 percentage points per year lower in countries that switched regimes.