

---

## **WHAT DOES REALLY DISCIPLINE FISCAL POLICY IN EMERGING MARKETS?**

### **THE ROLE OF EXCHANGE RATE REGIMES**

Enrique Alberola & Luis Molina

Banco de España

Work in progress, do not quote

24.07.02

Empirical evidence shows that fixed exchange rates do not provide more fiscal discipline than flexible regimes, despite the fact that, in principle, fixing the exchange rate imposes important restrictions on a traditionally relevant source of revenues: seigniorage. However, a more detailed analysis of seigniorage allows to explain the channels whereby monetary financing is possible in the short and medium run even in a exchange rate peg. In this paper, we argue that the traditional concept of monetary seigniorage is misleading and that fiscal seigniorage, defined as the actual revenues accruing to government from the Central Bank, is a more proper variable to determine fiscal discipline. We show that fixed regimes do not prevent fiscal seigniorage in the short run and therefore they do not do a good job in disciplining policy. Other more rigid regimes as currency boards could in principle restrain fiscal policy by ruling out fiscal seigniorage. but the recent experience in Argentina is at odds with this intuition. Indeed, fixing the exchange rate also contributed to relaxing the fiscal constraints offsetting the effect of constraints on seigniorage. Therefore, we intend to extend our evidence so as to uncover the additional effects of fixing the exchange rate on fiscal discipline, as the relaxation of the external constraint and the increase in revenues through economic expansion that a more rigid regime may bring about.

---

## 1- Introduction

During the nineties, the process of economic reform has gathered pace in Latinamerica, while Eastern European countries embraced economic transformation to become market economies. In a context of financial globalisation, macroeconomic stability has become the cornerstone for successful reform programs and advances in terms of price stability have been outstanding.

The quest for macroeconomic stability has traditionally had in the choice of exchange rate regime one of its central elements. Many countries have based their programs of economic stabilization on regimes of rigid or semi-rigid exchange rates. The rationale for this strategy is the following: Inflation is perceived as an structural problem, and fixing credibly the exchange rate allows to tie down inflation expectations; this induces a more disciplined behaviour in economic agents, facilitating overall economic reform.

More relevant for our approach, price stabilization also contributes to discipline public accounts: in emerging market economies fiscal systems and, thus, the ability to obtain revenue are weak; as a consequence, the financing of the deficits can be partially supplemented through money creation by the Central Bank (seignoriage revenues). The fall in inflation should drastically reduce seignoriage revenues, promoting fiscal reform and fiscal discipline.

Nevertheless, the empirical evidence is at odds with this theoretical prior. In figure 1 we observe that fixed exchange rate regimes have only attained a limited macroeconomic stability in emerging markets, compared to countries with flexible exchange rate regimes<sup>1</sup>: inflation performance is better but fiscal discipline does not improve: the total deficit is about the same, and the primary deficit (net of interest payments) is slightly higher.

The explanation of this striking fact, which has already been underscored by other authors in the case of Latin America (Gavin & Perotti (1998)) is the focus of this paper. We

---

<sup>1</sup> These data refer to emerging market economies in Latin America and East Europe. Details on the sample are given in the annex

---

can think of two possible reasons that dilute the potential disciplinary effect of fixed regimes on fiscal discipline:

1. Ineffective constraint on monetary financing. Pegging the exchange rate reduces inflation but it does not reduce, at least to the same extent, the ability of the government to obtain financing through the Central Bank process.
2. Offsetting outcomes from pegging Even if the monetary constraints are hardened in fixed exchange rate regime, they may relax other financial constraints for the government. More precisely, two additional sources of financing domestic expenditure can be identified beyond monetary financing:
  - a. Revenue financing, which is closely related to the level of activity. The literature of exchange rate based stabilization (see Calvo and Vegh (2000) for a survey) stresses the initial expansionary effect of fixing the exchange rate, so that, at least at its inception, fixed regime would tend to increase revenues and relax the financial constraint.
  - b. Debt financing The financing ability of the government depends on the needs and proclivity of investors to finance public deficits which tends to be reflected in the financing cost, and so may do fiscal discipline, especially in countries affected by limited creditworthiness and sudden capital draughts (Gavin et al. (1997)). In turn, the relaxation of external constraint may be determined by the exchange rate regime. For instance, by fixing the exchange rate the currency risk premium on debt would decrease, at least in the short run (that is, while the peg is credible). Moreover, fixing the exchange rate can easily contribute to reduce the burden of the debt, given the tendency for appreciation in exchange rate based stabilizations. Therefore, both the currency and solvency risk may decrease, capital flow more generously and the external financial constraint is relaxed

At this stage, we will just focus on the first issue: what are the actual effects of pegging the exchange rate on monetary financing. To approach this question, it is central to understand how seigniorage is channeled from the monetary creation process to the government through the central bank. In this context, an special type

---

of exchange rate arrangement, the currency board is intrinsically different from standard fixed exchange rate regimes because, in principle, they deter monetary authorities from financing fiscal deficits.

The structure of the paper is as follows. In section two, we briefly develop the traditional view which links fiscal discipline to the process of money creation. In section 3, it is shown how fixed exchange rates should be expected to generate fiscal discipline by reducing inflation and seigniorage, and empirically test this hypothesis. Section four develops the idea which is central to our discussion, namely, that the conventional concept of seigniorage is a bad indicator for fiscal discipline, and that a more restrictive concept, which we denote as fiscal seigniorage, is more relevant to assess the disciplinary effects of the exchange rate regimes. In section five, we study how currency boards differ from standard fixed regimes in that they suppress fiscal seigniorage, by severing the ability of the monetary authorities to finance public deficits. For this reason, they are expected to impose a much tighter constraint on fiscal policy and to induce a higher degree of fiscal discipline. Section 6 concludes and opens the way to further research.

## 2- Seigniorage as a source of deficit financing

The traditional approach to deficit monetization focuses on the following government budget constraint, which reflects the identity between the fiscal financing needs and sources, expressed in real terms:

$$d + (i - \delta)b = \dot{b} + m \quad (1)$$

Financial requirements are given by the total deficit, which is the sum of the primary deficit ( $d$ ) and the cost of the stock of debt in the hands of the private sector ( $b$ ), measured by the real interest payments. The real interest rate is the difference between the nominal interest rate and inflation ( $i - \delta$ ). The government can finance this deficit through two sources: in an orthodox way, by issuing debt in the capital markets, that is, by increasing the stock of debt in the hands of the private sector ( $\dot{b}$ )<sup>2</sup>, or by asking the Central Bank to buy her debt and pay it with money created for this purpose. The revenue collected from

---

<sup>2</sup> A dot refers to rate of growth in the variables.

---

this operation is known as seigniorage, which is commonly computed as the real increase in the monetary base, that is, the sum of banknotes and bank reserves ( $\dot{m}$ ).

Industrialized countries usually follow an orthodox financing of the public expenditure, through taxes and, when deficits appear, through debt. On the contrary, emerging economies usually lack developed tax systems and capital markets. Under these circumstances, seigniorage becomes a relevant source of revenue: in principle, monetary authorities can increase the monetary base and transfer the resulting revenues to the government in a discretionary way; the excess real balances will be adjusted by increases in the level price.

Indeed, revenues from seigniorage have typically been considered as a special form of taxation. To see this, note that the increase in the monetary base can be decomposed into two components:

$$\dot{m} = \left[ \frac{\dot{M}}{P} \right] = \frac{\Delta M}{M} \cdot \frac{M}{P} = \ddot{e}m \quad (2)$$

where  $P$  is the price level and high case letters refer to nominal variables. The first component is the rate of growth in the nominal monetary base ( $\ddot{e}$ ) and the second is the monetary base in real terms. In this expression,  $m$  is the tax base and  $\ddot{e}$  is the tax rate.

Let us then consider the simplest form of money demand:

$$\dot{e} \frac{M}{P} = kY \quad (3)$$

in which real balances depends on the income level and  $k$  is a constant parameter. Note that the real money supply is the monetary base times the money multiplier ( $\dot{e}$ ). Differentiating this expression, we obtain

$$\ddot{e} = \ddot{\delta} + \frac{k}{\dot{e}} \dot{y} \quad (4)$$

---

The rate of growth in income is usually of low order and the money multiplier usually takes values higher than unity. Thus, when inflation is moderate or high, the first term in the expression dominates and  $\dot{e}$  is expected to be closely associated with the inflation rate. Therefore, seigniorage is traditionally considered as an inflation tax<sup>3</sup>.

Seigniorage and inflation may thus play a central role in financing expenditures. Fischer (1982) computes seigniorage for developing countries and shows that it accounts in some cases for more than 20% of total revenues. Edwards and Tabellini (1991) observe that for Latin American countries the seigniorage in terms of GDP sometime reached dramatic magnitudes. For the largest countries, it was around 20% in Argentina between 1973 and 1987, 8.24% in Brazil (1983-87) and 4% in Mexico (1978-83). In our sample, the median of seigniorage is higher than 2% of GDP.

In this context, Sargent & Wallace (1981) suggested that inflation is a fiscal, rather than a monetary phenomenon because monetary policy is dominated by the financing needs of the government. Although this is probably a too radical view of the inflationary process, it well reflects the importance that fiscal aspects may have to explain inflation under certain circumstances.

An implicit assumption in these arguments is that the monetary base is discretionally managed by the Central Bank; or, in other words, that monetary seigniorage is supply driven. This assumption is however rather strong because the Central Bank is far from having a complete control on the base money. The monetary base consists of banknotes and commercial bank reserves. As our demand of money suggest, real incomes is a central determinant of the monetary base, in particular, of banknotes. Compulsory bank

---

<sup>3</sup> Inflation may have additional effects on the deficits. The first effect can be observed in expression (1): the interest payments term will be reduced by inflation as long as the nominal interest rate on debt does not reflect properly inflation expectations; this implies that only unexpected inflation can reduce the cost of debt service. The sign and magnitude of this effect depends on the inflation premium required for investing in domestic currency. Another effect, which is positive, is related to the fiscal drag; it refers to the higher taxes paid in progressive systems when the price level rises and taxes are not adjusted for inflation. Finally, the so-called Olivera-Tanzi effect is negative, as it arises from the lags in the collection of taxes which may be relevant in situations of very high inflation.

---

reserves are determined by reserve regulations, while non-compulsory reserves depend on the nature and efficiency of the payment system, and usually displays low interest elasticity. Therefore, the central bank may have difficulties to control the base money demand outside the compulsory reserves. Moreover, attempts to increase the monetary base beyond the desired holdings of banknotes and reserves may not be successful unless the Central Bank is ready to accept the interest rate adjustments necessary for the private sector to increase the base money and make use of the expanded liquidity.

### 3- Exchange rate regimes and fiscal discipline

#### 3-a) Fixed regimes as disciplinary devices

A credible fix of the nominal exchange rate ( $e$ ) will anchor monetary policy to the reference currency and, admitting that some form of Purchasing Power Parity is expected to hold, it will also stabilize inflationary expectations and reduce the ability to collect seigniorage.

This is evident if we replicate expression (3) for the foreign country (denoted by an asterisk) assuming for simplicity that the parameters take the same value, and compare the values of  $\ddot{e}$  and  $\ddot{e}^*$ :

$$\ddot{e} = \ddot{e}^* + (\ddot{\delta} - \ddot{\delta}^*) + \frac{k}{\dot{e}} (\dot{y} - \dot{y}^*) \quad (5)$$

The PPP theory, in terms of expectations, states that the expected depreciation of the exchange rate equals the inflation differences,  $\dot{e}^e \approx \dot{\delta} - \dot{\delta}^*$ . Therefore, if the exchange rate is credibly fixed,  $\dot{e}^e = 0$ , and the seigniorage revenues of the anchor country are low, as expected, only a higher economic growth than the anchor country would provide higher seigniorage revenues.

Therefore, a fixed exchange rate does not only reduce inflation but it should also constrain seigniorage relative to a flexible regime, thus inducing more fiscal discipline. In principle then, fixing the exchange rate provides an attractive way to macroeconomic stabilization.

---

### 3-b) Data and econometric considerations

Before dealing with the empirical evidence of exchange rate regimes on fiscal seigniorage, it is important to make several considerations regarding the data base and the variables and techniques to use, which will be also relevant for the rest of the analysis.

The first regards to the choice of the sample. We take observations of 24 emerging market economies and transition countries, of which 18 belong to Latin America, 11 are European states in transition, and then we add Israel, Russia and Turkey. The sample for the former runs from 1972 to 2001, and for the latter it starts, in the majority of cases, in 1990. From this wide sample we have excluded the observations corresponding to currency boards (28 additional observations) schemes, which will only be considered in the last section, and inflation and seigniorage outliers, leaving a sample of 561 observations. Countries must then be labeled according to their regime, which is not a straightforward task: as explained with more detail in the Annex, the IMF adopts a “strict” definition which leaves out important stabilization efforts through semi-fixed exchange rate regimes, such as crawling pegs. Therefore, we can consider two alternative samples: the IMF sample and a modified sample, in which, by examining more closely the nature of the exchange rate regimes<sup>4</sup>, we expand the proportion of fixed exchange regimes from 49% to 60%. In estimation the different regimes are defined by a dummy variable which takes the value of one for fixed regimes and zero for the flexible cases; obviously, the distribution of the dummy will change depending of the sample it is used.

Secondly, focusing on the link between regimes and deficits, we have to consider which concept of deficit reflects more adequately fiscal discipline: overall deficits or primary deficits, v.g. deficits net of interest payments ( $d$  in expression (1)). It can be argued that the concept of deficit on which the fiscal authorities have some discretion is the primary deficit; furthermore, the bulk of interest payments may not be independent of the regime, since inflation is relevant to determine the real cost of debt (see footnote 3). Finally, very high inflations as those eventually observed in our sample may completely distort the figures on interest payments, and therefore the magnitude of overall deficits. However, in all the contributions to this literature the results have always been presented either in terms of the

---

<sup>4</sup> Our results are basically coincident with those presented by Levi-Yeyati and Sturzenegger (2002)

---

overall deficits or both<sup>5</sup>. Thus, although the analysis of the primary deficit provides a better assessment of fiscal discipline, we will present the results for overall and primary deficits.

Another set of considerations is of econometric nature. The database allows the use of panel techniques in the analysis. In panel data estimation, individual effects are customarily included, but we consider that in some of our regressions this is inadequate. In particular, when regressing the variables against the regime dummies the results on the regression would be distorted; since introducing individual effects implies to subtract the cross-country averages from the variables in the regression, this would imply that what is regressed is the (cross-country) deviation of the dependent variable on the (deviation of) the regime dummy, therefore distorting the relevant relation to explore which is the level of deficit on the exchange rate regime<sup>6</sup>. In the rest of the cases (relation between deficits and seigniorage), we test on individual effects and introduce them when they turn out to be significant. Another problem which may arise in the data is heteroskedasticity, which leads to an important loss of efficiency in estimation, although the estimates are still unbiased and consistent. Since we are interested in the significance of the parameters rather than in their value, it is important to correct the estimations for heteroskedasticity. This is done by testing and in its case controlling for cross-country variances.

Finally, we must acknowledge the effect of economic activity on the deficit, which is expected to be countercyclical. Economic expansions have two consequences for the public finances: first, the higher tax and tariff revenues associated with the expansion reduce the fiscal deficit; the second effect is evident from (4): expansion leads to a higher demand and an increase in seigniorage. However, the special characteristics in expenditure and revenues flows make the effect of the activity on the budget unclear. In particular, Gavin & Perotti (1997) show that under certain circumstances the deficit is procyclical. In any case, in the regressions below we control, when required, for the effect of the cycle, defined as deviations of growth from the sample average in each country.

---

<sup>5</sup> Edwards and Tabellini (1991), Gavin & Perotti (1995), Tornell & Velasco (1998)

<sup>6</sup> Note also that, if individual effects were considered, there would be no difference between countries with only one type of regime in the whole sample, since the resulting dummy value (which would be defined as deviation from the mean value of the regime) would be in both cases equal to zero.

---

### 3-c) Empirical evidence

Figure 1 in the introduction showed in a broad way that fixed regimes reduce inflation but they fail to improve the fiscal performance. In this section we formally explore the effect of fixed exchange rate regimes on fiscal discipline, which is proxied by the ratio of fiscal deficits to GDP, by using a large sample of data and panel regression techniques.

The effect of the fixed regime on the fiscal balance appears in table 1. We have regressed the two measures of the deficit (as a proportion of GDP) against the regime dummy in both samples, and we have controlled by the lagged value of the deficit and the cyclical position of the economy and correcting for cross-sectional heteroskedasticity<sup>7</sup>. The value of the dummy is positive, albeit not significantly different from zero, regardless of the chosen fixed regime sample. Also note that the effect of the cycle on the overall deficit, which appears in the last row is negative and significant, implying that deficits are significantly countercyclical<sup>8</sup>

All in all, the effect of the fixed regime on fiscal discipline challenges the conventional wisdom: fixing the exchange rate does NOT generate disciplinary effects on fiscal policy.

### 4- Monetary v. Fiscal Seigniorage

The observed inability of fixed regime in capping fiscal deficits, contrasts with their positive effects on inflation reductions. Since the regression results show that even after controlling for the position in the cycle, that is, after taking into account the positive effects of the expansion, fixed regimes do not reduce the deficits, it is not obvious then how these deficits are financed by the government. One possibility is debt which, as suggested above, is easier to allocate in fixed rate regimes. The other possibility is that monetary seigniorage, which is the central link between inflation and fiscal deficits, is an inadequate proxy to

---

<sup>7</sup> Other controls include terms of trade or the real exchange rate, but they did not turn out to be significant when included in the deficit regressions.

<sup>8</sup> ; this result is contrary to the results of Gavin & Perotti (1997); however, the effect is non-significant for the primary deficit.

---

assess the financing of deficits through the process of money creation. We explore this second hypothesis.

#### 4-a) Fiscal seigniorage

Klein & Neumann (1991) first pointed at the misleading use of the concept of seigniorage in the context of public finances. Seigniorage, understood as the rate of growth in money creation is identified with an inflation tax, which, in strict terms, represents the opportunity cost of holding money. However, this private cost of holding money does not match the benefit accruing to the fiscal authorities. On the one hand, inflation generates a deadweight loss from which nobody benefits; on the other hand, and more importantly, the revenues from money creation do not necessarily flow to the fiscal authorities. It is evident that in the context of fiscal analysis, seigniorage should refer to the revenues effectively accruing to governments from the process of money creation. Indeed, stressing the difference between the first concept, to which we will refer as monetary seigniorage, and the second, denoted as fiscal seigniorage, turns out to be crucial in what follows.

Let us consider the balance sheet for flows of the Central Bank, expressed in domestic currency:

Changes in CB Balance Sheet

Reserves ( $e\dot{r} + \dot{e}r$ )	Monetary base ( $\dot{m}$ )
Private credit ( $\dot{c}$ )	Other net liabilities
Public Debt ( $\dot{f}$ )	

Let us now recall the process of deficit monetization, as traditionally described: public debt holdings by the Central Bank increase and simultaneously money is printed out increasing the monetary base, v.g.  $\dot{f} = \dot{m}$ . This process reveals that the financing needs of the Government are satisfied by the Central Bank through an increase in the holdings of public debt  $\dot{f}$  and that this variable is usually approximated by the changes in the monetary

---

base. However, in view of the Central Bank balance sheet this description is extremely problematic.

First, note that the holdings of public debt are assets to the Central Bank, and that it may even obtain interest income from them; on the contrary, the traditional view assumes that public debt holdings just 'sink' into the Central Bank accounts and, of course, they generate no yield to the monetary authority. This is equivalent to say that the Central Bank and the Government can consolidate their balances, since debt holdings (and its yields) would disappear from this consolidated balance.<sup>9</sup> This is probably a too strong assumption for industrialized countries, but it is more realistic for the countries in our data set, at least for the first part of the sample. Thus, either if we accept such extreme view or if we just recognize the privileged financing of deficits by Central Banks, we consider that the increase in government debt holdings by the Central Bank,  $\dot{f}$ , is a good proxy for the financing needs of government provided by the monetary authorities<sup>10</sup>.

Second, an more importantly, note that the Central Bank can keep on transferring resources to the government even if the monetary base is kept constant through adjustments in its balance sheet. Note that by reducing the level of reserves and the credit to the private sectors, the Central Bank can increase its holdings of public debt. More precisely, the holdings of government debt can be accommodated by changes in any other component in the Central Bank balance sheet, not just by increases in the monetary base:

$$\dot{f} = \dot{m} - (\dot{c} + \dot{e}r + e\dot{r}) \quad (6)$$

---

<sup>9</sup> See Klein and Neumann (1991). It is also important to note that this privileged financing affects the profit and loss accounts of the Central Bank. As a matter of fact, central Bank in emerging countries usually display important losses because they are also used by the government as privileged source of financing for the public sector firms or sustain dual exchange rate systems. Edwards (1997) computes the magnitude of Central Banks losses, which in extreme cases amount to more than 4% of GDP. In our sample, it is not possible to compute these losses, which are conveyed in the deficit variable.

<sup>10</sup> Privileged financing is expected to be highly correlated with the increase in  $f$ . It would also be useful to distinguish in the claims to governments between credits to the public sector and debt. The first item is more clearly associated with financing of deficits, while the second can be argued to be used for open market operations. Data do not allow for this distinction.

---

We will thus denote the increase in public debt holdings by the Central Bank,  $\dot{f}$ , as fiscal seignoriage, the actual revenues accruing to the government from the Central Bank to finance public deficit, in order to distinguish it from monetary seignoriage,  $\dot{m}$ , which just refers to the increase in the monetary base.

This distinction affects the budget constraint identity since the actual financing of the deficit by the monetary authorities is given by the fiscal seignoriage instead of the monetary seignoriage:

$$d + (i - \delta)b = \dot{b} + \dot{f} \quad (1')$$

and therefore fiscal seignoriage is the relevant variable to analyze how government deficits are financed by the monetary authorities and how exchange regimes affect the ability to finance public deficits.

#### 4-b) Empirical evidence

The discrepancy between fiscal and monetary seignoriage could a priori explain the protracted ability of fixed regimes to finance fiscal deficits, and therefore the lack of effects of fixing the exchange rates on fiscal discipline. To prove this hypothesis empirically we proceed in two steps: first, we test the link between deficits and the two alternative concepts of seignoriage and then how the exchange rate regime affects monetary and fiscal seignoriage.

The previous decomposition suggests that the relevant variable to explain how deficits are financed is the fiscal seignoriage and not the monetary seignoriage. Table 2 explores this hypothesis by regressing the fiscal deficit (overall and primary) on monetary and fiscal seignoriage, respectively, as a proportion of GDP. In all the cases, a lag of the dependent variable is included and the effects of the cycle are controlled for, when required. The results endorse our hypothesis: monetary seignoriage cannot explain fiscal deficits in any of the specifications, and the sign is even negative for the primary deficit, albeit non-significant which is contrary to the conventional hypothesis. On the contrary, fiscal

---

seigniorage is significantly and positively correlated with fiscal deficits, both overall and, more clearly, primary deficits<sup>11</sup>.

Second, we consider the effects of fixing the exchange rate on fiscal and monetary seigniorage, with the corresponding lags and controls. Fixing the exchange rate should reduce monetary seigniorage through disinflation, but not necessarily fiscal seigniorage, which can be accommodated in the short and medium run by the Central Bank. Table 3 presents the results: the negative sign of the fixed regime dummy and its robust significance in every case confirms that fixed regimes reduce monetary seigniorage. On the contrary, the effects on fiscal seigniorage are, if anything contrary to expectation, since it is marginally significant, with a positive sign in the case of the modified (and for us more accurate) sample.

These results suggest that the constraints imposed by the exchange rate regime on monetary seigniorage are overcome through adjustments in private credit and reserves in the balance sheet of the central bank. This allows to preserve fiscal seigniorage according to the financing needs of the fiscal authorities and regardless of the regime choice.

For our purposes, it is also interesting to consider the signs of the cycle effects. The effect is non-significant in the monetary seigniorage regression. On the contrary, the negative and significant sign of the cycle on fiscal seigniorage is more intriguing but we can advance the following interpretation: Economic expansions reduce fiscal deficits and therefore the financing needs of governments. Since fiscal seigniorage can be discretionally managed, it is reasonable to think that it is lower in good times. This is an alternative route to stress that fiscal seigniorage is the relevant variable to study how deficits are financed.

The outcome of the statistical analysis can be summed up as follows: in table 1 we have shown that, contrary to intuition, fixed exchange rate regimes have no effect whatsoever on fiscal deficits. This result can be explained by considering the distinction between monetary and fiscal seigniorage. Since fiscal deficits are financed by means of fiscal, not monetary seigniorage (table 2) and fixed regimes tend to reduce monetary but not

---

<sup>11</sup> These results coincide with those of Sikken & de Haan (1998) which explore similar relations with alternative specifications in an univariate context.

---

fiscal seigniorage (table 3), it follows that pegging the exchange rate does not constraint deficit financing and therefore it will not provide fiscal discipline.

It could then be argued that for a fixed exchange regime to be sustainable, fiscal seigniorage should also be reduced. The reduction of foreign reserves and private credit to preserve fiscal seigniorage revenues can only be transitory because they are finite. But note that this is precisely the bottom line of first generation models of speculative crises (Krugman, 1979): depletion of reserves eventually bring about the collapse of the regime. And this is what we actually observe in practice: fixed exchange rate regimes have been abandoned sooner or later in emerging countries amid speculative attacks which cannot be encountered.

## **5- The currency board as a disciplinary device**

Around thirteen currency boards operate in the world when this paper is being written. Of these, only five can be considered as stabilization devices to stop deterioration of the macroeconomic environment. Argentina was the first big, relatively closed economy which adopted this scheme in 1991 when it was suffering hyperinflation, and it was followed by some European transition economies, like Estonia, Lithuania and Bulgaria and Bosnia<sup>12</sup>.

*A currency board arrangement can be defined as 'a monetary regime based on an explicit legislative commitment to exchange domestic currency for a specific foreign currency at a fixed rate, combined with restrictions on the issuing authorities -the currency board- to ensure the fulfillment of its legal obligation. This structure implies that domestic currency be issued only against foreign exchange and that it remains fully backed by foreign assets.'* (IMF, 1997)

Therefore, the Currency Board replaces the Central Bank as issuing institution and the growth in the monetary base is determined by the evolution of foreign assets. **This is the relevant feature of currency boards, because it implies that the authorities all but renounce**

---

<sup>12</sup> The starting date and parity with the reference currency of these arrangements are: Argentina (April 1991, fixed parity 1:1 with the US dollar), Bulgaria (July 1997, fixed parity 1000:1 with the Deutsche mark), Lithuania (April 1994, fixed parity 4:1 with the US dollar), Estonia (January 1992, fixed parity 8:1 with the Deutschmark) and Bosnia (August 1997, fixed parity 1:1 with the Deutsche mark). The rest of currency board correspond to colonies or are reminiscent of colonial times: Hong Kong, Djibouti, member countries of the Eastern Caribbean Central Bank, Cayman Islands, Falkland Island, Gibraltar and Brunei. A detailed account of currency board operation and a evaluation of the regime can be found in IMF (1997) and references therein.

---

to accommodate the excess demand for liquidity. Moreover, currency boards are set by law, sometimes implying a constitutional amendment, like in Argentina. Thus, the explicit commitment for exchange rate management currency is higher than in standard fixed exchange regimes. Both factors tend to enhance the credibility of the currency board and they may contribute to explain its robustness. However, here we would like to stress the fiscal discipline aspects, which have been largely ignored in the analysis and which, in our view are quite relevant to explain the success of currency board regimes.

By definition, in a currency board the increase in monetary base equals the increase in the value of foreign reserves:

$$\dot{m} = \dot{e}r + e\dot{r}$$

This implies that the credit to the private sector and, more remarkably, the claims to the Government disappear from the Central Bank balance sheet. Thus, fiscal authorities cannot be financed by the monetary authority and fiscal seigniorage disappears. To be more precise, the only source of revenue for the Government from the monetary institutions are the profits that the currency board may make, in particular, from the yields on foreign reserves<sup>13</sup>.

Returning to our previous discussion on monetary and fiscal seigniorage, currency boards appear more properly suited to entrench fiscal discipline than other fixed regimes: fiscal deficits are related to the ability to generate fiscal seigniorage and the only exchange rate regime which rules out fiscal seigniorage is a currency board.<sup>14</sup> Figure 1 suggest that

---

<sup>13</sup> For example, in 1998 Argentina obtained 965 millions of pesos in interest payments for its foreign exchange reserves (around 2% of actual tax revenues). Central Bank's benefits accounts in 1998 around 863 millions of pesos, equivalent to 0,3% of GDP.

<sup>14</sup> Note that currency boards do not necessarily require a strictly fixed exchange rate to operate. Although the management of currency boards has always been implemented within fixed exchange rates regimes, currency boards also would eliminate fiscal seigniorage if they were run in a managed float or in a crawling peg, that is allowing for changes in the nominal exchange rate ( $\dot{e} \neq 0$ ). As the condition states, changes in  $\dot{e}r$  could then be backed by equal changes in the monetary base. Also note that the effects of a currency board on fiscal discipline are very similar to those of the dollarization of the economy. In this second case, there is no need for the Central Bank or the currency board to operate, and the revenues from holding foreign reserves would disappear. On the positive side, the interest rate differentials between the currency board country and the reference should be expected to dwindle too, as the peg of the exchange rate is perceived as irrevocable and the exchange rate premium disappears.

---

fiscal performance of currency boards slightly better and Figure 2 summarizes this information of seigniorage after the adoption of the currency board and compares it with the performance of fixed and flexible regimes. While monetary seigniorage is similar in currency boards and fixed regimes, fiscal seigniorage is zero in currency boards.

However, a more robust econometric evidence would be desirable to confirm the hypothesis. Table 4 presents the regression results of a currency board dummy on the relevant variables, comparing its performance with the rest of fixed exchange rate regimes (both IMF and modified-IMF samples). The currency board dummy is significant on monetary and fiscal seigniorage, in all the cases.. However, the dummy on both the overall and primary deficit is not significant, although it has the expected sign.

All in all, the econometric evidence on the disciplinary effect of currency boards is not robust, although it is clear that fiscal seigniorage is suppressed by it. The relatively short experience with currency boards weights on the evidence: first, there is a lack of observations (only 28) to make inferences; second, the inertia of fiscal variables at the initial observations may also bias the results.

## **6- Conclusions**

This paper has analyzed the role of exchange rate regimes in providing fiscal discipline. The empirical analysis has shown that, despite its theoretical appeal, fixed regimes are unable to constrain fiscal authorities because they do not reduce the ability of the Central Bank to finance fiscal deficits.

The traditional view states that monetary seigniorage (the increase in the monetary base) allows to finance fiscal deficit and that fixed regimes, by capping this source of revenue from the Central Bank generates fiscal discipline. This argument is refutable on two basis. On the one hand, it implicitly assumes that the management monetary base is completely discretionary by the monetary authority in a flexible regime, while it depends on other structural factors; on the other hand, even if we accept the discretionality argument, monetary seigniorage turns out to be a bad indicator of the financing resources provided by the Central Bank to the Government. The relevant variable has been shown to be fiscal

---

---

seigniorage, that is, the revenues effectively accruing to the fiscal authorities from the Central Bank activity.

Thus, even if fixed regimes effectively constraint monetary seigniorage they have not limited fiscal seigniorage and therefore they have not induced fiscal discipline.

In this context, currency boards may appear as an attractive regime to achieve fiscal discipline because they impose effective constraints on public finances by suppressing fiscal seigniorage and therefore they should act as strong disciplinary devices for fiscal policy.

Empirical evidence does not yield strong support for this hypothesis. More illustratively the recent Argentine crises provides a more clear example of the limitations of the currency board in practice. Tellingly, the diagnosis of the Argentine crises tends to give an important weight to the fiscal problems (Mussa (2002), implicitly implying that fiscal discipline was not enough the convertibility.

One can argue that the choice of the exchange rate regime must be consistent with the economic, social and political circumstances to fulfill its goals, and that this consistency was not present in Argentina. But note that the problems of Argentina became only evident when economic dynamism faltered and, in the end, when markets started to turn their back to Argentina by increasing the risk premia. In other words, during the good years of the economic boom, the financing constraints for Argentina imposed by the currency board were not relevant because they were offset by hefty domestic revenues and generous capital flows at affordable rates.

This conclusion shows the convenience of exploring the effects of exchange rate regimes on fiscal discipline beyond seigniorage considerations. In the introduction we noted that, at least in the short run, fixing the exchange rate may relax the financing constraint of the government by engineering an expansionary cycle and by reducing the cost of financing the deficit. Therefore, our next step will be to address these issues.

*Table 1 Fiscal deficits and the exchange rate regime*

<i>Sample</i>	<i>Overall deficit</i>	<i>Primary deficit</i>
<b>IMF</b>		
Fixed regimes	0.04 (**)	0.26 (**)
(t ratio)	(0.20)	(1.14)
<b>IMF modified (a)</b>		
Fixed regimes	0.11 (**)	0.22 (**)
(t ratio)	(0.70)	(1.33)
Real business cycle (b)	(-)	(0)

*Note:* estimation via weighted least squares, heteroskedasticity corrected by cross sectional variance. An asterisk indicates that the variable is not significant at 90 per cent level, and two asterisks mean that the variable is not significant at 95 per cent level.

(a) The exchange rate regime defined according to IMF 'strict' definition adding some episodes of exchange rate based stabilizations through not strictly fixed exchange rates.

(b) We show in brackets the sign of the effect of the real business cycle on the variables. A zero is shown when this effect is statistically not significant.

---

*Table 2 Fiscal deficits and seignorages*

<i>Seignorage</i>	<i>Overall deficit</i>	<i>Primary deficit</i>
Monetary seignorage (t ratio)	0.02 (**) (0.51)	-0.03 (**) (-0.80)
Fiscal seignorage (t ratio)	0.05 (3.75)	0.08 (2.84)
Real business cycle (a)	(-)	(0)

*Note:* estimation via weighed least squares, heteroskedasticity corrected by cross sectional variance. An asterisk indicates that the variable is not significant at 90 per cent level, and two asterisks mean that the variable is not significant at 95 per cent level.

(a) We show in brackets the sign of the effect of the real business cycle on the variables. A zero is shown when this effect is statistically not significant.

*Table 3 Seignorages and the exchange rate regime*

<i>Sample</i>	<i>Monetary seignorage</i>	<i>Fiscal seignorage</i>
IMF		
Fixed regimes	-0.47	0.15 (**)
(t ratio)	(-2.55)	(0.60)
IMF modified (a)		
Fixed regimes	-0.45	0.34 (*)
(t ratio)	(-3.33)	(1.84)
Real business cycle (b)	(0)	(-)

*Note:* estimation via weighted least squares, heteroskedasticity corrected by cross sectional variance. An asterisk indicates that the variable is not significant at 90 per cent level, and two asterisks mean that the variable is not significant at 95 per cent level.

(a) The exchange rate regime is defined according to IMF 'strict' definition adding some episodes of exchange rate based stabilizations through not strictly fixed exchange rates.

(b) We show in brackets the sign of the effect of the real business cycle on the variables. A zero is shown when this effect is statistically not significant.

*Table 4 Fiscal variables and seignorages in currency boards (CB) regimes*

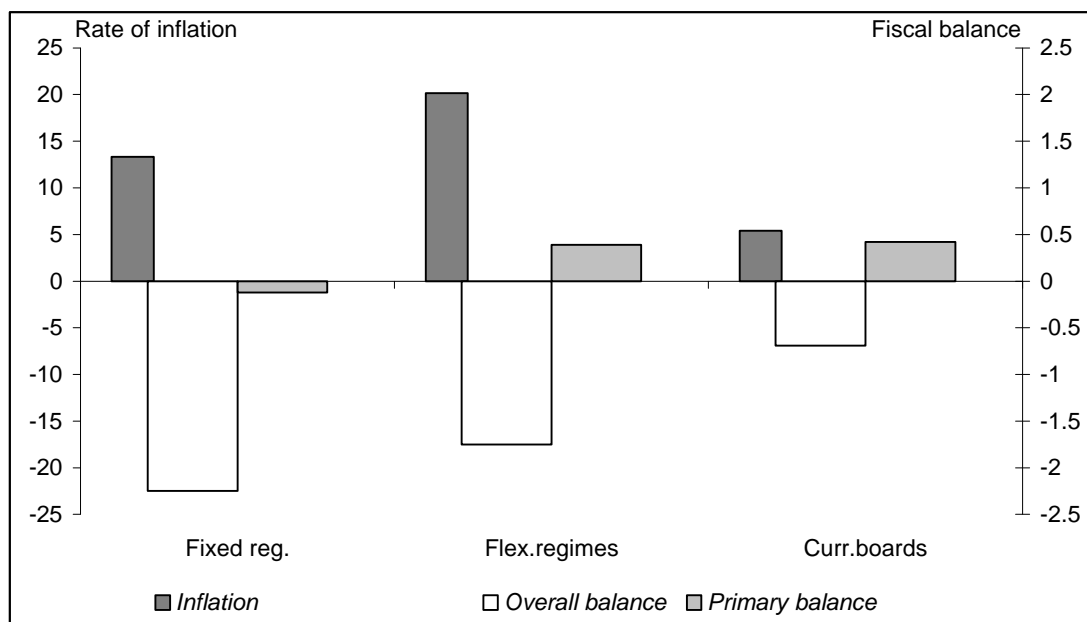
<i>Sample</i>	<i>Overall deficit</i>	<i>Primary deficit</i>	<i>Monetary seignorage</i>	<i>Fiscal seignorage</i>
IMF				
CB regimes	-0.39 (**)	-0.48 (**)	-0.82	-0.51
(t ratio)	(-1.06)	(-1.28)	(-2.63)	(-2.38)
IMF modified (a)				
CB regimes	-0.28 (**)	-0.19 (**)	-0.65	-0.67
(t ratio)	(-0.81)	(-0.60)	(-2.38)	(-2.46)
Real business cycle (b)	(-)	(0)	(+)	(0)

*Note:* estimation via weighed least squares, heteroskedasticity corrected by cross sectional variance. All regressions refers to a subsample including only fixed exchange rate regimes. An asterisk indicates that the variable is not significant at 90 per cent level, and two asterisks mean that the variable is not significant at 95 per cent level.

(a) Exchange rate regime is defined according to IMF 'strict' definition adding some episodes of exchange rate based stabilizations through not strictly fixed exchange rates.

(b) We show in brackets the sign of the effect of the real business cycle on the variables. A zero is shown when this effect is statistically not significant.

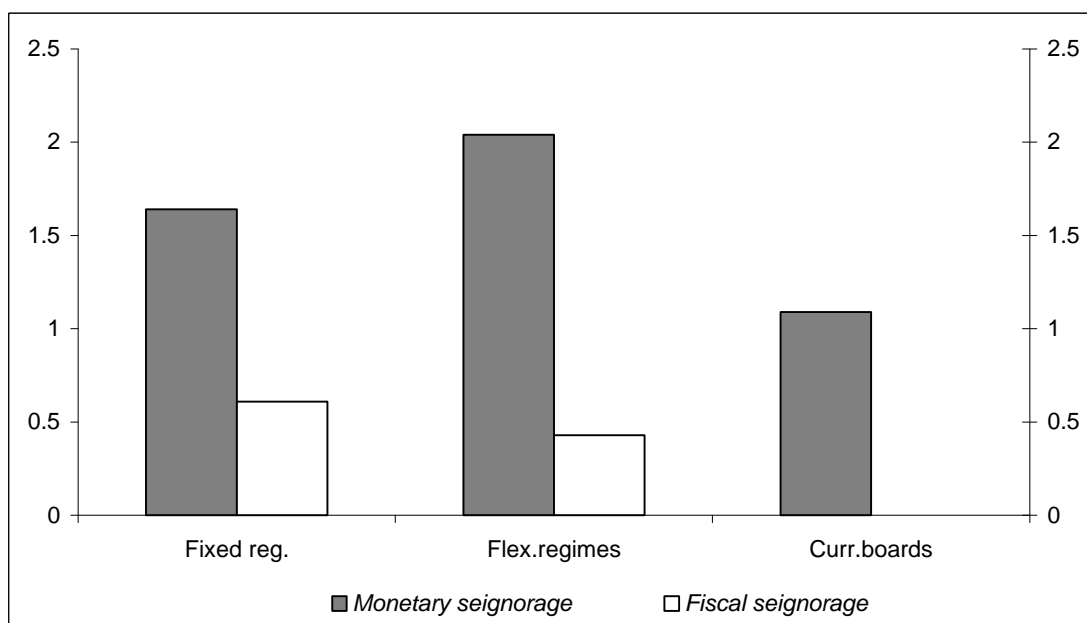
Figure 1 Economic performance of emerging market economies



Note: sample median for each variable. Exchange rate regimes is defined according to IMF 'strict' definition, that is, considering fixed exchange rate regimes as those labelled as 'pegged to a single currency' or 'pegged to a composite of currencies'.

---

Figure 2 Economic performance of emerging market economies



Note: sample median for each variable. Exchange rate regimes is defined according to IMF 'strict' definition, that is, considering fixed exchange rate regimes as those labelled as 'pegged to a single currency' or 'pegged to a composite of currencies'.

---

## REFERENCES

Calvo,G.A. & C.A.Vegh (1998), Inflation stabilization and BOP crises in developing countries, *Handbook of Macroeconomics, forthcoming*

Edwards,S. and G. Tabellini (1991). Explaining fiscal policies and inflation in developing countries, *Journal of International Money and Finance, 10, S16-S48.*

Eichengreen,B. and P.Masson (1998), Exit Strategies. Policy options for countries seeking greater exchange rate flexibility, *IMF Occasional Paper, 168.*

Fischer,S. (1982). Seigniorage and the case for a national money, *Journal of Political Economy, .90, 295-313.*

Gavin,M. & R.Perotti (1997), Fiscal policy in Latin America, *NBER Macroeconomic Annual, 11-71*

Gavin,M., R.Hausmann, R.Perotti and E.Talvi (1997), El manejo de la política fiscal en América Latina y el Caribe: volatilidad, comportamiento procíclico y capacidad crediticia limitada, *Revista BCV, enero-junio, 14-61*

Gulde, A., J.Kähkönen, P.Keller et al.(1999). Pros and cons of Currency Board arrangements in the lead-up to EU accession and participation in the Euro zone, *paper presented at a Seminar on 'Currency boards in the context of accession to EU' organized by the European Commission in Brussels.*

Hamann,A.J. (1999), Exchange-rate based stabilization: a critical look at the stylized facts, *IMF, WP/99/132*

IMF (1997), Currency Board Arrangements. Issues and Experiences, *IMF Occasional Paper, 151.*

IMF (1999), Exchange rate arrangements and currency convertibility: developments and issues, *World Economic and Financial Surveys*

IMF.Exchange Rate Arrangements And Exchange Restrictions: Annual Report”, various issues.

Kaminsky G.L., Lizondo,S.and Reinhart, (1997), Leading indicators of currency crisis, *Board of Governors of the Federal Reserve System, mimeo.*

---

Kiguel, M. N. Leviatan (1992), The business cycle associated with exchange rate based stabilization, *The World Bank Economic Review*, 6, 279-305

Klein, M., M. von Neumann (1991), Seigniorage: what is it and who gets it?, *Weltwirtschaftliches Archiv*, 206-221.

Levy-Yeyati, E. & Sturzenegger, F. (2002), Classifying exchange rate regimes: Deeds vs. Words, *Presentation at LACEA forum*

Masson, P. (1999), Monetary and exchange rate policy of transition economies of Central and Eastern Europe after the launch of EMU, *IMF Working Paper PDP/99/5*

Mussa, M. (2002), Argentina and the Fund: From Triumph to Tragedy, Institute for International Economics, mimeo

Rodriguez (1982), The Argentine stabilization Plan of December 20<sup>th</sup>, *World Development*, 10, 801-811

Reinhart, C. & Rogoff, K. (2002), The modern history of exchange rate arrangements: a reinterpretation, *NBER Working Paper WP8963*

Sargent, T. & N. Wallace (1981), Some unpleasant monetarist arithmetic, *Federal Reserve of Minneapolis Quarterly Review*, 5, 1-17.

Sikken, B.J., J. de Haan (1998). Budget deficits, monetization and central bank independence in developing countries, *Oxford Economic Papers*, 50, 493-511.

Tornell, A. & A. Velasco (1998), Fiscal discipline and the choice of a nominal anchor in stabilization, *Journal of International Economics*, 46, 1-30.

Vegh, C.A. (1992), Stopping high inflation: an analytical overview, *IMF Staff Papers*, 39, 626-695.

---

## ANNEX: DATA SOURCES AND METHODOLOGIES

This section presents an overview of the data we have used in the empirical tests. We have selected 32 emerging markets economies and transition countries, of which 18 are from Latin America, other 11 are European transition countries, and the last three are Israel, Russia and Turkey<sup>15</sup>. The choice is made on the basis that for all these countries the choice of exchange rate regime has played and continues to play a central position in monetary policy strategies.

The data are taken from the IMF “International Financial Statistics”. They include the official exchange rate, in units of local currency per US dollar (*line ae*), claims on governments of monetary authorities (*line 12a*, and, if it exists, *lines 12b and 12c*, which refer to local governments and public enterprises), reserve money (*line 14*), consumer prices (*line 64*), the government deficit or surplus (*line 80*), and nominal and real GDP (*lines 99*). Data for interest payments on public debt from the IMF “Government Finance Statistics” and from World Bank database are used to construct series of primary deficit. When it is possible, we have complemented these statistics with national data. In general, we have data from 1972 to 2001 for Latin American countries, Israel and Turkey, and from 1990 to 2001 for European transition countries and Russia.

We define “monetary seigniorage” as the annual change in reserve money scaled by nominal GDP, as in Fischer (1982), and fiscal seigniorage as the annual change in monetary authorities claims on government scaled by nominal GDP. It is immediate to see that these calculations are equivalent to the definitions appearing in the text. Consumer price indices are used to calculate the rate of inflation, and the cyclical position is computed as deviations from average growth. We have eliminated from the sample some data which could be considered as “outliers” (see the main text). We have defined inflation outliers as those in the last decile of the sample, leaving observations whose inflation rate is less than 120% a year, and seigniorage outliers as those which fall beyond the 95<sup>th</sup> centile; this

---

<sup>15</sup> Selected countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela, Nicaragua, the Dominican Republic, El Salvador, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Romania, the Slovak Republic, Croatia, and Israel, Russia and Turkey.

---

excludes observations whose monetary seigniorage is higher than 12% of GDP and whose fiscal seigniorage is higher than 17% of GDP. This leaves a maximum of 561 observations although for some variables, most notably primary deficits, the availability of data is lower.

The more difficult issue we had to deal with was the definition of the exchange rate systems of each country in each year. Our main source of information had to be, in principle, IMF “Exchange Rate Arrangements And Exchange Restrictions: Annual Report”, in which the IMF classified exchange rate arrangements as “Pegged”, “Limited flexibility”, and “More flexible arrangements”. So first of all we construct the “IMF sample” of the main text taking fixed exchange rate regimes as those labeled as “Pegged” according to IMF at the end of each year, as in Gavin & Perotti (1997).

But this definition poses many problems, as it does not include some Exchange Rate Based Stabilizations (ERBS) instrumented via not strictly fixed exchange rates, like crawling pegs or crawling bands, which are labeled as “More flexible arrangements” by the IMF. The IMF itself recognizes this problem in a recent publication (IMF(1999)), and reclassifies many countries’ arrangements from year to year. Finally, in 1999 issue of “Exchange Rate Arrangements...”, and in subsequent publications, IMF labels the exchange rate regimes not as fixed or flexible like previously, but as currency boards, crawling pegs, target bands, etc., letting the reader to decide which is a pegged exchange rate and which is not. One of the best examples of the possible inadequacy of IMF’s previous definition is the Brazilian *Plano Real*, a “genuine” ERBS dated in July 1994 which was instrumented within a crawling peg system from 1995 to January 1999, and which was labeled as “managed floating” by the IMF.

Having this in mind, we have filtered the IMF sample and constructed an alternative to be used along with the former. We have added some episodes of semi-fixed exchange

---

rate arrangements that countries implemented with a clear stabilization objective<sup>16,17</sup>. Finally, when a country changes its system we have changed its definition if the change occurs in the last six months of the year. In Table A.1 we show the differences between IMF stricter sample and our sample:

---

<sup>16</sup> This could be the reason why we consider Brazil 1994 as a ERBS, although it was a crawling peg system, and a Money Based Stabilization Bolivia 1986, a country which currency has been depreciating against the US dollar at a much slower pace than the Brazilian's one. However, in IMF (1999) Bolivia is considered again as a fixed exchange rate, as "the deviations of the market exchange rate from the official exchange rate (...) are extremely tight (...), and that the regime is in practice a crawling peg aimed at maintaining the competitiveness of the economy". Finally, in most recent issues of IMF's International Financial Statistics some countries are marked with an asterisk, denoting that "this country has a *de facto* regime which differs from its *de iure* regime". These considerations show that the definition of the regime is not a easy issue. To define these episodes we have consulted, among others, Kiguel & Liviatan (1992), Tornell & Velasco (1998), Hamann (1999) and IMF (1999).

<sup>17</sup> Two recent papers, those by Reinhart and Rogoff (2002) and by Levy-Yeyati and Sturzenegger (2002) also changes IMF strict definition. Reinhart and Rogoff distinguish between a "standard" definition of an exchange rate regime, based on IMF classification, and a "natural" definition, based on the performance of the official exchange rate, declarations from the Government, the behavior of the Central Bank, and so on. More or less, our modified sample coincides with the "natural" classification of Reinhart and Rogoff. Levy-Yeyati and Sturzenegger take five types of exchange rate arrangements, from floating to currency boards, not making any distinction between flexible and fixed regimes.

---

Table A.1 Differences between samples

<i>Country</i>	<i>Date</i>	<i>IMF sample</i>	<i>Modified sample</i>
Argentina	1979-1980	Flexible	Fixed ( <i>Tablita</i> )
Argentina	1985-1986	Flexible	Fixed ( <i>Plan Austral</i> )
Bolivia	1997-1998	Flexible	Fixed
Brazil	1986	Flexible	Fixed ( <i>Cruzado</i> )
Brazil	1994-1998	Flexible	Fixed ( <i>Plano Real</i> )
Chile	1978	Flexible	Fixed
Chile	1985-1997	Flexible	Fixed
Colombia	1992-1998	Flexible	Fixed
Ecuador	1995-1998	Flexible	Fixed
Honduras	1997-1998	Flexible	Fixed
Mexico	1988-1994	Flexible	Fixed
Uruguay	1978-1982	Flexible	Fixed ( <i>Tablita</i> )
Uruguay	1992-1998	Flexible	Fixed
Venezuela	1996-1998	Flexible	Fixed
Hungary	1995-1998	Flexible	Fixed
Latvia	1994-1996	Flexible	Fixed
Poland	1991-1998	Flexible	Fixed

Source: IMF (1999).

Finally, in table A.2. we show the median of the main variables for the different exchange regimes, distinguishing between the two alternative regime samples:

Table A.2 Main features of the samples

	<i>IMF sample</i>	<i>Modified sample</i>
<b>Number of observations</b>		
Flexible regimes	218	220
Fixed regimes	155	341
Currency Boards	17	28
<b>FLEXIBLE REGIMES</b>		
<b>Sample median</b>		
Overall balance	-1.73	-1.75
Primary balance	0.48	0.39
Inflation	23.94	20.17
Monetary seigniorage	2.35	2.04
Fiscal seigniorage	0.98	0.43
Real GDP growth	3.75	3.58
Interest payments	1.81	1.78
<b>FIXED REGIMES</b>		
<b>Sample median</b>		
Overall balance	-1.79	-2.25
Primary balance	-0.17	-0.12
Inflation	11.54	13.32
Monetary seigniorage	1.69	1.64
Fiscal seigniorage	0.73	0.61
Real GDP growth	4.71	4.32
Interest payments	1.23	1.45
<b>CURRENCY BOARDS</b>		
<b>Sample median</b>		
Overall deficit	-0.71	-0.69
Primary deficit	0.46	0.42
Inflation	10.60	5.41
Monetary seigniorage	1.44	1.09
Fiscal seigniorage	-0.00	0.00
Real GDP growth	4.91	4.83
Interest payments	1.09	1.24

Source: own calculations.